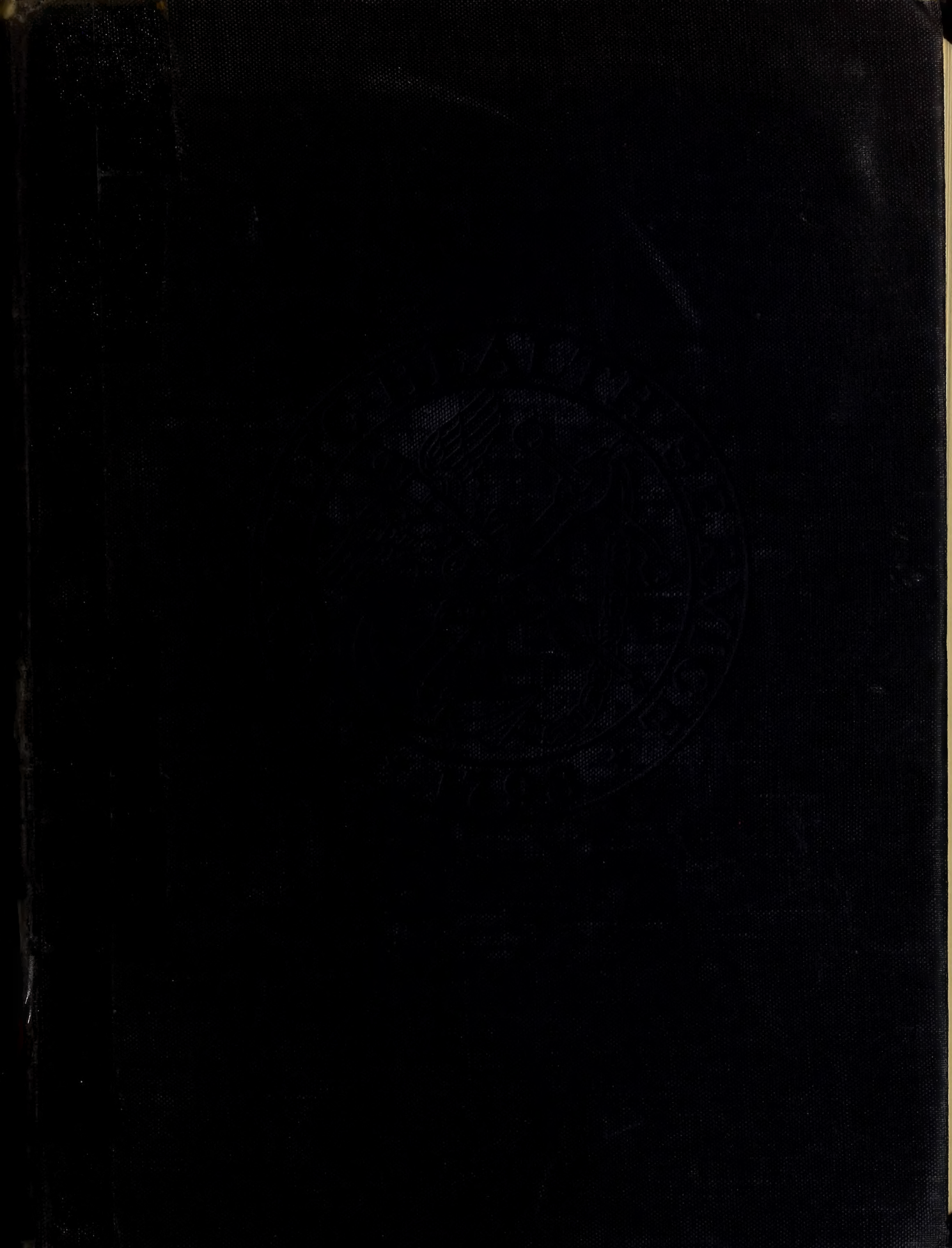


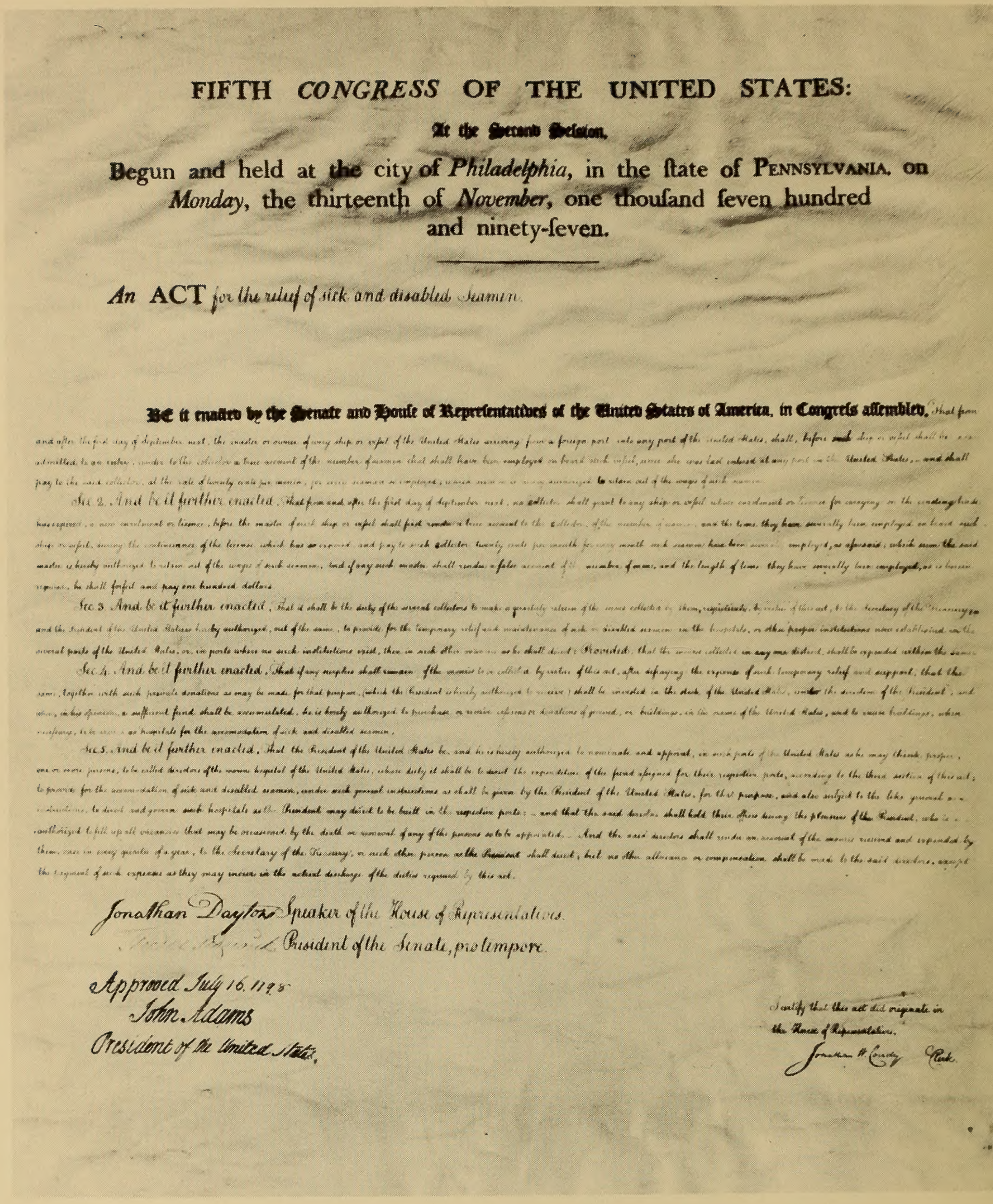
THE UNITED STATES PUBLIC HEALTH SERVICE

1798-1950

United States Marine Hospital Service
1798-1902

United States Public Health and Marine Hospital Service
1902-1912

United States Public Health Service
Since 1912



FIFTH *CONGRESS* OF THE UNITED STATES:

At the Second Session.

Begun and held at the city of *Philadelphia*, in the ſtate of PENNSYLVANIA, on *Monday*, the thirteenth of *November*, one thouſand ſeven hundred and ninety-ſeven.

An ACT *for the relief of sick and disabled Seamen.*

BE it enacted by the Senate and House of Representatives of the United States of America, in Congreſs aſſembled, That from and after the first day of September next, the master or owner of every ship or vessel of the United States arriving from a foreign port into any port of the United States, shall, before such ship or vessel shall be admitted to an entry, render to the collector a true account of the number of seamen that shall have been employed on board such vessel, since she was last entered at any port in the United States, and shall pay to the said collector, at the rate of twenty cents per month, for every seaman so employed; which sum he is hereby authorized to retain out of the wages of such seamen.

Sec. 2. And be it further enacted, That from and after the first day of September next, no collector shall grant to any ship or vessel whose enrolment or license for carrying on the coasting trade has expired, a new enrolment or license, before the master of such ship or vessel shall first render a true account to the collector, of the number of seamen, and the time they have severally been employed on board such ship or vessel, during the continuance of the license which has so expired, and pay to such collector twenty cents per month for every month such seamen have been severally employed, as aforesaid; which sum the said master is hereby authorized to retain out of the wages of such seamen. And if any such master shall render a false account of the number of men, and the length of time they have severally been employed, as is herein required, he shall forfeit and pay one hundred dollars.

Sec. 3. And be it further enacted, That it shall be the duty of the several collectors to make a quarterly return of the sums collected by them, respectively, by virtue of this act, to the Secretary of the Treasury; and the President of the United States is hereby authorized, out of the same, to provide for the temporary relief and maintenance of sick or disabled seamen in the hospitals, or other proper institutions now established in the several ports of the United States, or, in ports where no such institutions exist, then in such other manner as he shall direct: Provided, that the monies collected in any one district, shall be expended within the same.

Sec. 4. And be it further enacted, That if any surplus shall remain of the monies to be collected by virtue of this act, after defraying the expense of such temporary relief and support, that the same, together with such private donations as may be made for that purpose, (which the President is hereby authorized to receive) shall be invested in the stock of the United States, under the direction of the President; and when, in his opinion, a sufficient fund shall be accumulated, he is hereby authorized to purchase or receive cessions or donations of ground, or buildings, in the name of the United States, and to cause buildings, when necessary, to be erected as hospitals for the accommodation of sick and disabled seamen.

Sec. 5. And be it further enacted, That the President of the United States be, and he is hereby authorized to nominate and appoint, in such ports of the United States as he may think proper, one or more persons, to be called directors of the marine hospital of the United States, whose duty it shall be to direct the expenditure of the fund assigned for their respective ports, according to the third section of this act; to provide for the accommodation of sick and disabled seamen, under such general instructions as shall be given by the President of the United States, for that purpose, and also subject to the like general instructions, to direct and govern such hospitals as the President may direct to be built in the respective ports: and that the said directors shall hold their offices during the pleasure of the President, who is authorized to fill up all vacancies that may be occasioned by the death or removal of any of the persons so to be appointed. And the said directors shall render an account of the monies received and expended by them, once in every quarter of a year, to the Secretary of the Treasury, or such other person as the President shall direct; but no other allowance or compensation shall be made to the said directors, except the payment of such expenses as they may incur in the actual discharge of the duties required by this act.

Jonathan Dayton Speaker of the House of Representatives.

[illegible] President of the Senate, pro tempore.

Approved July 16, 1798

John Adams

President of the United States.

I certify that this act did originate in the House of Representatives.

Jonathan W. Condy Clerk.

Act of July 16, 1798

The
UNITED STATES PUBLIC HEALTH SERVICE

1798 *1950*

By

RALPH CHESTER WILLIAMS, M.D.

ASSISTANT SURGEON GENERAL
UNITED STATES PUBLIC HEALTH SERVICE
WASHINGTON, D. C.

Washington, D. C.

COMMISSIONED OFFICERS ASSOCIATION OF THE
UNITED STATES PUBLIC HEALTH SERVICE

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HISTORY
OF
SCIENCE
AND
MEDICINE

THIS BOOK IS PUBLISHED BY THE
COMMISSIONED OFFICERS ASSOCIATION OF
THE UNITED STATES PUBLIC HEALTH SERVICE
BOX 5874, BETHESDA, MARYLAND

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Washington, D. C.

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BY WHITTET & SHEPPERSON, RICHMOND, VIRGINIA

DEDICATION

This history is dedicated to those men and women of the Public Health Service who have given their lives in line of duty and to those who, through the past one hundred and fifty years, at the bedside of patients, at lonely quarantine stations, in raging outbreaks of epidemic diseases, in research laboratories, in time of peril and public disaster, at far-flung field outposts, and at administrative desks, have given so liberally and unselfishly of their loyal efforts. Honor to the humble and to the great!

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Foreword

THE HISTORY of the Public Health Service through the past one hundred and fifty-two years was written by those whose work and achievements are recorded in the pages of this book. The material presented gives a brief history of the origin, evolution, organization, and activities of the Public Health Service since its establishment in 1798. This record is intended to be factual. There is, of necessity, a divergence of opinion among those familiar with the work of the Service as to what should be included or what should be omitted. Many of these decisions have been exceedingly difficult to make. Friendly critics who have read the manuscript in whole or in part have prevented the inclusion of many errors. With their help, it is hoped the book has been made reasonably accurate, but the responsibility for it as it stands rests entirely upon the undersigned.

The heritage of the Public Health Service of today goes back through the years of war and peace very nearly to the beginning of our national history. Its early work, recorded here, stands as an eloquent tribute to those who served when our health horizon was narrowed by limitations of knowledge and authority. This record of progress and achievement provokes a pride in all members of the Service.

Although campaigns for the control and prevention of specific diseases such as smallpox and yellow fever date back for three-fourths of a century or more, general public health work in the modern sense had its beginning about fifty years ago. The effects of some of these public health programs, such as the virtual elimination of typhoid fever and immunization campaigns for the prevention and control of diphtheria, are now evident. Working closely with State and local health authorities for the past seventy-five years, the Service has striven to recognize the important public health problems as they arose, and looks forward to continuing an effective working relationship with State and local health authorities and all other organizations genuinely interested in improving the health of the people of this nation.

The task of preparing this history has been greatly facilitated by the fine cooperation and assistance given by a large number of both active and retired officers and employees of the Service. Many persons have prepared abstracts, statements, brief sketches, and other material that have been utilized. Thanks are here rendered to all who made such contributions.

Pharmacist Director Raymond D. Kinsey (Retired) has been especially helpful in reviewing drafts of chapters, in verifying facts and dates, and in many other ways rendering aid without which this book could not have been satisfactorily completed.

Always a wise counselor, Assistant Surgeon General John W. Kerr (Retired) has been of particular assistance in supplying background material concerning many phases of early Service activities. His constructive criticism has been invaluable.

Assistant Surgeon General Justin K. Fuller (Retired) has read the manuscripts meticulously and submitted many sound suggestions.

Mr. Brock C. Hampton, an experienced editor over a period of many years, has given worthwhile aid in reviewing manuscripts and offering pertinent comments.

The guidance of Mr. Charles E. Felton, who served as Executive Assistant and friend to Surgeons General Wyman, Blue, Cumming, and Parran, has been particularly useful.

Medical Director Victor H. Haas has given assistance in many ways, especially in submitting objective comment on the manuscripts referred to him.

Sanitary Engineer Director Arthur P. Miller has been of great help in compiling information concerning the sanitation and engineering work of the Service.

Appreciation is expressed to Mrs. Clintie Kenney for compiling and preparing most of the material used in the chapter dealing with the Hygienic Laboratory and its successor, the National Institutes of Health.

I am indebted to the personnel of my immediate office for typing the manuscript, securing photographs and illustrations, and handling many other innumerable details that are essential to the preparation

of a volume such as this. My especial thanks are due Mrs. Polly Ayers, Miss Dorothy Schmidt, and Mrs. Margaret Chapman for their patience, their understanding, and their ever-present spirit of helpfulness.

To the older officers and friends of the Service, it is hoped that the reading of these pages will bring pleasure. To the younger officers and all those engaged in public health work everywhere, it is hoped that this history will imbue them with the determination to carry forward unceasingly the search for and the application of knowledge for the betterment of the health of the people of the United States and of the world. To all others, it is a record of creditable accomplishment by a devoted group of public servants.

RALPH C. WILLIAMS, M.D.

Washington, D. C.
January 15, 1951

THE UNITED STATES PUBLIC HEALTH SERVICE

1798-1950

CHAPTER I

Origin and Background: Hospitals

Medicine is an ever growing and ever changing body of knowledge.

—AUTHOR UNKNOWN.

Hospitals for Seamen in the British Isles

THE CONCEPT that the United States Government should provide medical care for merchant seamen when sick or disabled apparently had its origin in the British Isles. This is not surprising as much of our common law and many of our other civil institutions as well as other features of American life are patterned after those of the British Isles.

Following the defeat and destruction of the Spanish Armada in 1588, the seamen composing the victorious fleet, the largest ever assembled under the English flag, became the heroes of the nation. In response to a general demand that some benefits should be provided for them, a hospital for their care and treatment was established at Greenwich, near London. This hospital was open for seamen of the Royal Navy and was supported by a deduction of sixpence per month from the wages of each seaman. Later, this facility was augmented by the establishment of another institution at the Chatham dockyards. It was known as the Chatham Chest.

Samuel Pepys, in his diary under date of November 13, 1662, records the results of an inspection of the Chest. He says:

> Our first work to read over the institution, which is a decree in chancery in the year 1617, upon an inquisition made at Rochester about that time into the revenues of the Chest, which had been from the year 1588 or 1590, by the advice of the lord high admiral and principal officers then being, by consent of the seamen settled, paying 6 pence per month, according to their wages then, which was then but 10s., which is now 24s.

In a history of Rochester, England, the following reference to this institution is found:

> The Chest at Chatham was originally planned by Sir Francis Drake and Sir John Hawkins in 1588, after the defeat of the Armada. The seamen voluntarily agreed to have "defalked" out of their wages certain sums to form a fund for relief. The property became considerable, as well as the abuses, and in 1802 the Chest was removed to Greenwich.

About a century after the establishment of the Chatham Chest, a demand arose for similar provisions in behalf of the seamen of the merchant marine from which group men for the Royal Navy were largely recruited.

In the Parliament of King William III, sitting in the seventh and eighth years of his reign, there was enacted (March 1696) a law for the "encouragement and increase of seamen." This Act provided that seamen who registered themselves for service and became, by reason of age, wounds, or other accidents, disabled for future service at sea and "not able to maintain themselves comfortably," should be provided for in the Royal Hospital at Greenwich. For the maintenance of this institution a tax of sixpence per month was taken out of the wages "of every seaman employed in the merchant service, as well as those employed in the service of the Royal Navy."

Subsequent Acts of Parliament added to the number of beneficiaries of the hospital at Greenwich, creating a clientele too large for its limited capacity. It was thus found necessary to provide additional means for the care of these beneficiaries, not only at the Port of London but at the growing maritime city of Liverpool. In 1747, the officials charged with the execution of this hospital Act were directed by Act of Parliament to proceed at once to establish a "sixpenny hospital" at Liverpool. This hospital was for the use of "decay'ed seamen, their wives, and children," and continued in operation until 1826, when it was razed.

Funds Collected in American Colonies

The influence of the English system of hospital care for merchant seamen is evidenced by the fact that "hospital money" had been col-

lected in the American colonies since 1730. The seamen of the American colonies were taxed to support the hospital at Greenwich by an Act of Parliament passed in the second year of the reign of George III. Instructions given to Patrick Gordon, Deputy Governor of the Province of Pennsylvania, February 2, 1729, were that the sum of sixpence per month was required to be deducted from the wages of all seamen, English subjects, sailing in and out of American ports.

The system of hospitals contemplated by the Act establishing the Marine Hospital Service was designed to meet the needs peculiar to our own country during its early development as a nation. The 13 original colonies, at the time of securing their independence from the British Crown, were located along the Atlantic seacoast from Georgia to what is now the State of Maine. The young Republic of the United States, in the early years following the gaining of our independence, realized that she must develop and build a strong merchant marine as an important factor in the commerce of the country and to serve as an auxiliary to naval forces in case of threatened or actual war. A strong merchant marine industry requires hearty, healthy men. One of the means utilized for securing a sturdy merchant marine was the establishment of a system of medical care for sick and disabled seamen, supported by a small tax from the wages of the seamen beneficiaries. The construction of local hospitals did not furnish a solution to this problem. On the contrary, utilization of local hospitals by sick seamen increased the difficulties because in many ports numbers of sick seamen without a place for their care had imposed an undue burden upon local facilities and resources.

The Boston Marine Society was formed in 1742, with a view to promoting the general interest of navigation and to assist unfortunate mariners and their families. It is interesting to note that John Adams, who later became President of the United States and signed the Act establishing the Marine Hospital Service, was an active member of the Boston Marine Society. The official name of a similar organization in New York was "The Marine Society of the City of New York in the Province of New York, America." It was organized in November 1768 for the purpose of forming a society for the relief of dis-

tressed shipmasters and their widows and children, and also for the promotion of maritime knowledge. Leonard Lispenard was its first President, and the original membership listed 71 persons. There was 200 pounds sterling in the treasury. After 10 years, there were 650 members, and its funds amounted to 3,500 pounds.

These local societies later were important factors in stimulating the Congress of the New Republic to enact the law which established the Federal Marine Hospital Service.

The following is a synopsis of the charter granted by King George III to the Marine Society of New York:

George III, by the Grace of God, of Great Britain, France and Ireland, King, defender of the faith, and so forth: To all whom these presents shall come, Greeting:

Whereas our loving subjects Leonard Lispenard and James Jauncy of our City of New York, Esquires Jacob Leroy, William Walton, John Harris Cruger, Samuel Ver Planck, Lawrence Kortwright and Theophilat Bache of our said City, Gentlemen: Lewis King, Thomas Randall, Daniel Styles, Augustine Lawrence, Anthony Rutgers, Robert Dale and Robert Benson of our said City, mariners; in and by their humble petition present to our trusted and well beloved Cadwallader Colden, Esquire, our Lieutenant Governor and Commander-in-Chief of our Province of New York and territories dependent thereon in America, on the 7th day of March in this the tenth year of our reign and read the same day in our council for said Province have set forth in substance: that the petitioners, agreeable to the example to the several places on the continent of North America had, with at least fifty other persons, most of them either principal inhabitants of our said City of New York, or masters of vessels sailing out of the port of New York, formed themselves into a Marine Society for the purpose of improving maritime knowledge and for the relieving of indigent and distressed (and the wives and orphan children of deceased) masters of vessels . . .

. . . and for the more immediate carrying into execution our royal will and pleasure herein, we do hereby assign, contribute and appoint the above mentioned Leonard Lispenard to be the first president. John Leake, vice president, Linus King, treasurer, and Robert Benson, secretary.

There is little doubt that this charter was the basis for the statement sometimes heard in the early days of the Service that the original Marine Hospital Service was founded by King George III.

States Establish Hospitals for Merchant Seamen

Virginia early recognized the need for a hospital at Norfolk for seamen. Before 1705 Lieutenant-Governor Alexander Spotswood "urgently recommended that a hospital with every convenience obtainable in those times should be built as a part of the fort at Point Comfort for the use of sailors needing medical or surgical attention."

On April 15, 1708, the Council ordered

> . . . that a house be hyred for the accommodation of the sick men belonging to her Majesty's Ship the Garland and that the Rent of the said house be paid out of her Majesty's Revenue of two Shils per hogshead and it is recommended to Collo William Wilson to provide a house accordingly.

In October 1780, the Commonwealth of Virginia enacted a law requiring that the sum of ninepence per month be collected as "hospital money" from the pay of all seamen and marines in the State. Naval officers were constituted the collectors of the tax, and were allowed a commission of five per centum on the monies collected. In 1782 the amount was changed by law from ninepence to a shilling per month. On December 20, 1787, a law was passed establishing a Marine Hospital and authorizing the appointment of a commission by the Governor to select a site in the town of Washington, County of Norfolk, Virginia.

A newspaper, *The New Hampshire Spy,* under date of November 4, 1788, published an article bearing the date line of September 24, 1788, Norfolk, Virginia, which commented on the fact that the last foundation stone of the Marine Hospital had been laid on that date.

The State of North Carolina enacted a law providing for the creation of a hospital fund in 1789, and by a subsequent Act (1790), the Commissioners of the Poor at the different ports of entry were empowered to act as Collectors. The plan was financed by a capitation levy upon seamen.

The enactments of the English Parliament in imposing a tax upon seamen for the maintenance of hospitals for seamen, and the action of several of the States in setting up similar hospital funds, were well known to the Congress. On July 20, 1789, at the opening session of the

First Congress of the United States, the initial proceedings to establish a system for the relief of sick and disabled seamen were begun, when it was

> . . . ordered that a committee be appointed to bring in a bill or bills providing for the establishment of hospitals for sick and disabled seamen. . . .

Nothing was accomplished beyond this action by the First and Second Congresses, and it was not until four years later that the matter was again considered. The proposal to establish a Marine Hospital Service did not make progress because of the opposition of Congressmen from Massachusetts and some of the other States. The opposition from the New England States may have been of a political character, as reference to party principles appears in the records of the consideration of the bill. At the first session of the Fourth Congress, an Act was passed providing for the protection of American seamen and to prevent their imprisonment by a foreign power.

An early step in providing medical care for seamen was an Act which, among other things, required a ship's medicine chest for vessels in the merchant service of the United States. Section 8 of an Act for the government and regulation of seamen in the merchant service, approved July 20, 1790, states:

> That every ship or vessel belonging to a citizen or citizens of the United States, of the burthen of one hundred and fifty tons or upwards, navigated by ten or more persons in the whole, and bound on a voyage without the limits of the United States, shall be provided with a chest of medicines, put up by some apothecary of known reputation, and accompanied by directions for administering the same; and the said medicines shall be examined by the same or other apothecary once at least in every year, and supplied with fresh medicines in the place of such as shall have been used or spoiled; and in default of having such medicine chest so provided and kept fit for use, the master or commander of such ship or vessel shall provide and pay for all such advice, medicine, or attendance of physicians as any of the crew shall stand in need of in case of sickness, at every port or place where the ship or vessel may touch or trade at during the voyage, without any deduction from the wages of such seaman or mariner.

A committee of Congress appointed on February 28, 1797, to inquire into the operation of the Act for the relief and protection of American seamen, reported that:

. . . the committee find that numbers of seamen, as well as foreigners and natives, arrive at different ports of entry in such a disabled situation that they were becoming a great burden to the public hospitals where any such are established, or are left to perish for want of proper attention.

The committee recommended that funds be raised for the relief of sick and disabled American seamen in ports of the United States as well as in foreign ports, either by an additional tonnage tax on all vessels entering the ports of the United States or by a charge on the wages of all seamen shipped within the United States.

Bill for Relief of Sick and Disabled Seamen Becomes Law

The final effort, which resulted in the enactment into law of provisions that became the Act approved July 16, 1798, was undertaken by members of the House representing the then great maritime ports of the United States—New York, Baltimore, and Charleston. Philadelphia was then the Capital of the United States. Congressman Edward Livingston from New York took the leading part in securing the enactment of this bill.

The text of the Act is as follows:

FIFTH CONGRESS OF THE UNITED STATES
AT THE SECOND SESSION,

Begun and held at the city of Philadelphia, in the State of Pennsylvania, on Monday, the thirteenth of November, one thousand seven hundred and ninety-seven

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An ACT for the relief of sick and disabled Seamen.

BE IT ENACTED BY THE SENATE AND HOUSE OF REPRESENTATIVES OF THE UNITED STATES OF AMERICA, IN CONGRESS ASSEMBLED, That from and after the first day of September next, the master or owner of every ship or vessel of the United States arriving from a foreign port into any port of the United States, shall, before such ship or vessel shall be admitted to an entry, render to the collector a true account of the number of seamen that shall have been employed on board such vessel, since she was last entered at any port in the United States,—and shall pay to the said collector, at the rate of twenty cents per month, for every seaman so employed; which sum he is hereby authorized to retain out of the wages of such seamen.

Sec. 2. And be it further enacted, That from and after the first day of September next, no collector shall grant to any ship or vessel whose enrollment or license for carrying on the coasting trade has expired, a new enrollment or license, before the master of such ship or vessel shall first render a true account to the collector, of the number of seamen, and the time they have severally been employed on board such ship or vessel, during the continuance of the license which has so expired, and pay to such collector twenty cents per month for every month such seamen have been severally employed, as aforesaid; which sum the said master is hereby authorized to retain out of the wages of such seamen. And if any such master shall render a false account of the number of men, and the length of time they have severally been employed, as is herein required, he shall forfeit and pay one hundred dollars.

Sec. 3. And be it further enacted, That it shall be the duty of the several collectors to make a quarterly return of the sums collected by them, respectively, by virtue of this act, to the Secretary of the Treasury;—and the President of the United States is hereby authorized, out of the same, to provide for the temporary relief and maintenance of sick or disabled seamen in the hospitals, or other proper institutions now established in the several ports of the United States, or, in ports where no such institutions exist, then in such other manner as he shall direct: Provided, that the monies collected in any one district shall be expended within the same.

Sec. 4. And be it further enacted, That if any surplus shall remain of the monies to be collected by virtue of this act, after defraying the expense of such temporary relief and support, that the same, together with such private donations as may be made for that purpose (which the President is hereby authorized to receive), shall be invested in the stock of the United States, under the direction of the President; and when, in his opinion, a sufficient fund shall be accumulated, he is hereby authorized to purchase or receive cessions or donations of ground or buildings, in the name of the United States, and to cause buildings, when necessary, to be erected as hospitals for the accommodation of sick and disabled seamen.

Sec. 5. And be it further enacted, That the President of the United States be, and is hereby authorized to nominate and appoint, in such ports of the United States as he may think proper, one or more persons, to be called directors of the marine hospital of the United States, whose duty it shall be to direct the expenditure of the fund assigned for their respective ports, according to the third section of this act; to provide for the accommodation of sick and disabled seamen, under such general instructions as shall be given by the President of the United States, for that purpose, and also subject to the like general instructions, to direct and govern such hospitals as the President may direct to be built in the respective ports:—and that the said directors shall hold their offices during the pleasure of the President, who is authorized to fill up all vacancies that may be occasioned by the death or removal of any of the persons so to be appointed. And the said directors shall render an account of the monies received and expended by them, once in every quarter of a

year, to the Secretary of the Treasury, or such other person as the President shall direct; but no other allowance or compensation shall be made to the said directors, except the payment of such expenses as they may incur in the actual discharge of the duties required by this act.

JONATHAN DAYTON, Speaker of the House of Representatives.

THEODORE SEDGWICK, President of the Senate, pro tempore.

Approved July 16, 1798
JOHN ADAMS
President of the United States

I certify that this act did originate in the House of Representatives.

JONATHAN W. CONDY, *Clerk.*

Secretary of the Treasury Oliver W. Wolcott, Jr., under whom the Marine Hospital Service was organized, was the son of a signer of the Declaration of Independence. After its establishment, the Marine Hospital Service was placed under the Revenue-Marine Division of the Treasury Department. Under the Act, the President was authorized to nominate and appoint directors of Marine Hospitals, and such persons were authorized to govern these hospitals as the President might direct. The President at first reserved the appointment of the medical officers to himself. Later, it became customary for the Collectors of Customs to make the appointments.

The original Act establishing the Marine Hospital Service provided for a tax of 20 cents a month to be taken out of the wages of all American seamen and required that the "monies collected in any one district shall be expended within that District." This was amended the following year, by the Act of March 2, 1799, which authorized the expenditure of hospital money within any port of the State in which collected or in the next adjoining State, with the exception of Massachusetts, New Hampshire, and Connecticut. All money collected in these three States was required to be expended within their borders. Three years later these limitations were abolished.

Benefits of Service Extended to Officers and Men of Navy

The amending Act of March 2, 1799, also extended the benefits of the Act providing for the care and treatment of sick and disabled sea-

men of the merchant marine to the officers and men of the Navy, and the Secretary of the Navy was directed to deduct 20 cents monthly from the pay of such officers and men for that purpose. This made the officers and men of the Navy eligible for treatment in hospitals of the Marine Hospital Service.

Taxing American seamen 20 cents a month to provide for their medical care was among the first direct taxes enacted by the new republic, and was the first prepaid medical care program in the United States.

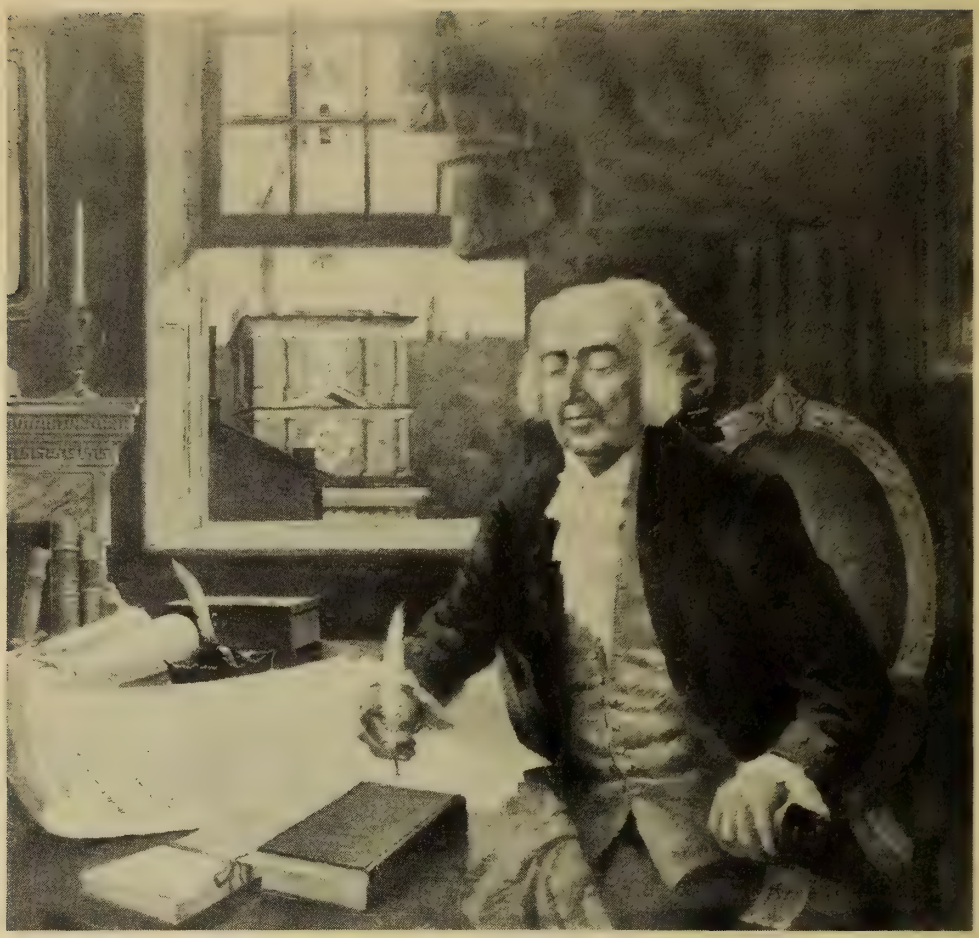
Although the Act was approved in July 1798, it required some time for the machinery to be set up whereby the collections were made and sufficient funds accumulated at the different ports to make money available to provide medical relief. The Comptroller of the Treasury under date of September 19, 1798, prescribed the form of the quarterly abstracts reporting on the fund.

Secretary of the Treasury Oliver W. Wolcott, Jr., on May 29, 1799, wrote a letter to Benjamin Lincoln, Collector of Customs, at Boston, inviting his attention to Castle Island as being a proper place for the establishment of a temporary Marine Hospital and mentioning that Dr. Thomas Welsh had been particularly recommended as a "gentleman well-qualified for the appointment of physician to the hospital." The Collector was asked to ascertain under what conditions Doctor Welsh would serve and to arrange the terms of compensation.

Dr. Thomas Welsh, on June 14, 1799, advised the Collector of Customs at Boston that he was willing to accept the Marine Hospital work. He agreed that Castle Island was the most suitable place for a temporary hospital and pointed out that it would be necessary to repair a barrack then in use, to construct one or more other buildings, and, in the meantime, to provide a steward, nurse, beds, bedding, and utensils. On June 25, 1799, the Secretary of War wrote the Collector of Customs at Boston stating that he had received a letter from the Secretary of the Treasury regarding the building of a new barrack and the making of repairs at Castle Island for the purpose of a hospital for sick seamen. He further stated that he had given orders to Jonathan Jackson, Esq., to make the repairs and build the barracks according to the Collector's directions. He added that it would be necessary to erect the new barrack at a distance from the barracks occupied by troops.

(This copy of a portrait of Mr. Livingston was made available through the courtesy of the Art Commission, New York City.)

Congressman Edward Livingston of New York, who introduced and guided through the House the bill that became the Act of July 16, 1798.



(Painting by Garnet W. Jex, of Arlington, Virginia)

An artist's conception of John Adams approving an Act for the Relief of Sick and Disabled Seamen, July 16, 1798.

First Medical Officer Appointed

Doctor Welsh was appointed by President Adams as the first medical officer of the Marine Hospital Service, and he furnished the first medical care given under the Act of July 16, 1798, at Boston about July 1799. He remained in charge of the work of the Marine Hospital Service at Boston until 1802.

In 1799, Doctor Welsh also had a contract with the Secretary of War for attending the sick of the troops on Castle Island in Boston Harbor. This island had formerly been used as a Quarantine Station. Castle Island is now known as Fort Independence and is reputed to be one of the oldest fortified places in the United States, a small fort having been erected on the site in 1634.

The hospital at Castle Island was considered a temporary arrangement to be used only until a suitable building could be erected in a locality more convenient for seamen. With this in mind, Congress passed the legislation necessary to make funds available for a permanent establishment.

In a letter dated May 6, 1802, Secretary of the Treasury Wolcott advised Benjamin Lincoln, Collector of Customs at Boston, that Congress had directed that $15,000 of the hospital money be applied to the erection of a hospital in Massachusetts. Since the vicinity of Boston was considered as the best place for it, the Collector was requested to report on the best situation and the probable expense of ground and buildings to enable the President to take the steps necessary to carry the law into effect.

Doctor Welsh was born in Charlestown, Massachusetts, June 1, 1751. He was graduated from Harvard College in 1772, being honor man in a class of 48. He studied medicine under Dr. Isaac Foster of Charlestown, was present at the battles of Lexington and Bunker Hill, and served with the Revolutionary Army in New York and New Jersey as Surgeon of the 27th Continental Regiment. At the close of the war, he settled in Boston. He was a member of the Boston Medical Society, which planned and organized the Massachusetts Medical Society in 1781, of which Doctor Welsh became the first treasurer, holding office

for sixteen years, 1782-1798. He was also a member of the American Academy of Arts and Sciences and its treasurer from 1796 to 1798. For many years, Doctor Welsh was prominent in civic affairs in Boston. He died on February 16, 1831.

Doctor Welsh drafted the following regulations which were approved by the President in March, 1800.

REGULATIONS FOR THE HOSPITAL FOR RELIEF OF SICK AND DISABLED SEAMEN IN THE HARBOUR OF BOSTON.

The Steward of the hospital shall be charged with the procuring of such supplies as may not otherwise be furnished, and with the safe keeping and issuing of all supplies, and shall preserve order in the hospital.

The principal nurse shall take care that the wards, beds, bedding and cloathing of the patients, and the utensils, be kept in neat order, and that the most exact economy be observed in her department.

A nurse will be allowed to assist the principal nurse to every ten sick or wounded patients, and shall be under her direction.[1]

Whenever there are men in the Hospital in that state of convalescence as in the opinion of the Surgeon to admit that they may be employed, such men while they remain in the hospital shall perform such reasonable service as the surgeon shall direct, and all who have recovered and are waiting for orders to go on board some ship or vessel, shall perform such service as may be directed.

All officers of the Navy and of the Marines and all seamen and marines in the public service of the United States, and all officers and seamen in the merchant service, may be admitted into the hospital whenever from wounds, sickness or infirmity it may become necessary, unless the disorder with which they are visited is contagious or malignant and they shall obey the orders and regulations thereof.

No gambling of any kind is to be allowed in the hospital.

No patient shall pass beyond the limits marked out for the accommodation of the hospital without leave obtained therefor.

Diet Table for the Hospital for the relief of sick and disabled seamen in the public and private service of the United States in the harbour of Boston, by which the Steward is to regulate his issues.

Per day—Full. 1 pound fresh meat, 2 gills rice or 4 gills Indian meal, 1 gill molasses, or 8 gills milk, 1 pound bread.

Per Day—Half. 2 gills rice, 4 gills Indian meal, 1 gill molasses or 8 gills milk, ½ pound fresh meat, ¾ pound bread.

Per day—Low. 1 gill rice, or 2 gills Indian meal, ½ gill molasses, 1 gill milk, ½ oz. coffee or chocolate or ¼ oz. tea, 2 oz. sugar and 1 pound bread.

1. This was not a professional nurse. The first trained nurse in the United States was Linda Richards, who completed her professional training in 1875.

Per day—Milk. 2 gills rice, or 4 gills Indian meal, 3 pints milk, and ½ pound bread.
Per day—Fever. Water gruel, Panada, herb tea, as may be ordered by the Surgeon according to circumstances.
Nurses and orderly men to draw a full ration.
Soap, salt, candles, vinegar, spirits, wine, vegetables and wood, as much as are necessary to be supplied, shall be directed by the Surgeon.

RULES AND ORDERS

OF THE

United States Marine Hospital,

ESTABLISHED AT CHARLESTOWN.

ARTICLE I.

THE OVERSEER or STEWARD is to go through all the wards in the morning before the Physician visits them, to see that the men have washed their hands and faces, and that nothing offensive be left in the rooms; and he is to go again through the wards before bed time to see that all the patients be in the house; and that none remain in it that do not belong to it.

ARTICLE II.

Every patient is to retire to rest on or before nine o'clock in the winter months; and by ten in the summer; and no lights are to be allowed, or fire kept up, after that period, unless some special case should require it.

ARTICLE III.

Every patient in the house is enjoined to pay strict obedience to the orders of the Steward or Overseer; and should any patient think himself at any time aggrieved, he has the liberty of appealing to the Physician.

ARTICLE IV.

Every patient is to be shaved every Sunday and Wednesday; and shirted every Sunday, and oftener, if convenient; and he is to wash his face and hands and comb his head every day, if his case and circumstances will admit of it.

ARTICLE V.

Every patient is forbidden to spit on the floor or hearth, or write on the walls, or mark the wood work, or drive nails in either.

ARTICLE VI.

If any man pertinaciously disobeys the orders of the Physicians or overseers, or gets drunk, or commits riot, or is found guilty of theft, he forfeits the privilege of the hospital, and shall be dismissed.

ARTICLE VII.

No patient is allowed to go to Boston, or to any distance from the hospital without permission from the Physician, or Overseer, or house-pupil.

ARTICLE VIII.

If any patient be found to throw away his medicine, or feign complaints; or who wilfully does any thing to impede his cure, he shall, upon conviction thereof be dismissed.

ARTICLE IX.

No person is allowed to play cards, or any other game of hazard for money, drink, or any other article.

All games of amusement, accompanied with noise are forbidden, as they disturb the sick.

ARTICLE X.

Whatever patient be out of the house all night without permission from the Physician or Overseer, is from that time dismissed.

ARTICLE XI.

All the patients shall be in their own wards, and places when the Physician is ready to visit them, of which they will be notified by the ringing of the bell.

ARTICLE I.

NURSES—Are to see that the patients be neat and clean as the nature of their cases will admit. They are to see particularly as to the cleanliness of the bed and bedcloaths. They are to see that the wards be kept extremely clean; and that they be aired, by keeping the windows and doors open in fair weather, a longer or shorter time, as the weather may admit. And they are to see that no nastiness of any kind be thrown out of the windows or doors.

ARTICLE II.

The nurses, male or female, are, upon no pretence, to alter the diet ordered by the Physician; nor to suffer the patients to use any other diet, than what is allowed by the hospital; nor are they to permit spirituous liquors of any kind to be brought into the wards, except what is directed by the Physician. They are to attend to the particular disgusts and cravings of the sick, and report them to the Physician.

ARTICLE III.

The effects of men, who die in the hospital, are to be locked up, and reported as soon as may be to the Physician; and if any nurse, attendant, or any other person, should take away or conceal any article belonging to such as die in the hospital, their crime shall be reported to the *Superintendent*.

ARTICLE IV.

The hours for admission of patients are between 10 and 12; but should any that are lame or weak present themselves before or after that time, the house-pupil, or the overseer, or the head-nurse, may receive them; and give them such articles of food only as are allowed in the *low diet*, until the Physician see them.——No person can be admitted into the hospital with the itch, or any other infectious disorder, the venereal excepted.

ARTICLE V.

No Seaman can be admitted into the hospital without a written certificate from the Custom-House, that he has paid hospital money.

APRIL, 1808.

Benj. Waterhouse Physician to M.H.

Rules and Orders Signed by Dr. Benjamin Waterhouse for the Marine Hospital, Charlestown (Boston), Mass.

First Hospital Erected

With the authorization for a Marine Hospital at the port of Boston and the acceptance of the bid for its construction, the President, on December 20, 1802, appointed Dr. Charles Jarvis to be the physician in charge at a salary of $1,000 per annum to take effect when the sick should be removed to the new hospital to be located at Charlestown. After having been at Castle Island (Fort Independence) for over four years, the temporary hospital was moved early in January 1804 to the new building in Charlestown which had been erected at a cost of $14,-842.34. When the hospital patients and equipment were moved from Castle Island, Dr. Charles Jarvis succeeded Dr. Thomas Welsh as Physician in Charge of the Marine Hospital at Boston.

Dr. Benjamin Waterhouse, who was "Professor of the Theory and Practice of Physic" at Harvard, was appointed physician in charge of the Marine Hospital at Boston on November 27, 1807. He continued in that capacity until July 18, 1809. He proposed making the Marine Hospital at Boston

> . . . answer the purpose of medical instruction as well as the primary one of comforting and healing the sick and wounded.

During the time that he was in charge of the Marine Hospital at Boston, the hospital was used to introduce the active practice of medicine to the medical students at Harvard. Thus, a Marine Hospital became the first teaching hospital in the United States. His plan was to provide the best available medical care to the patients in the hospital, and at the same time

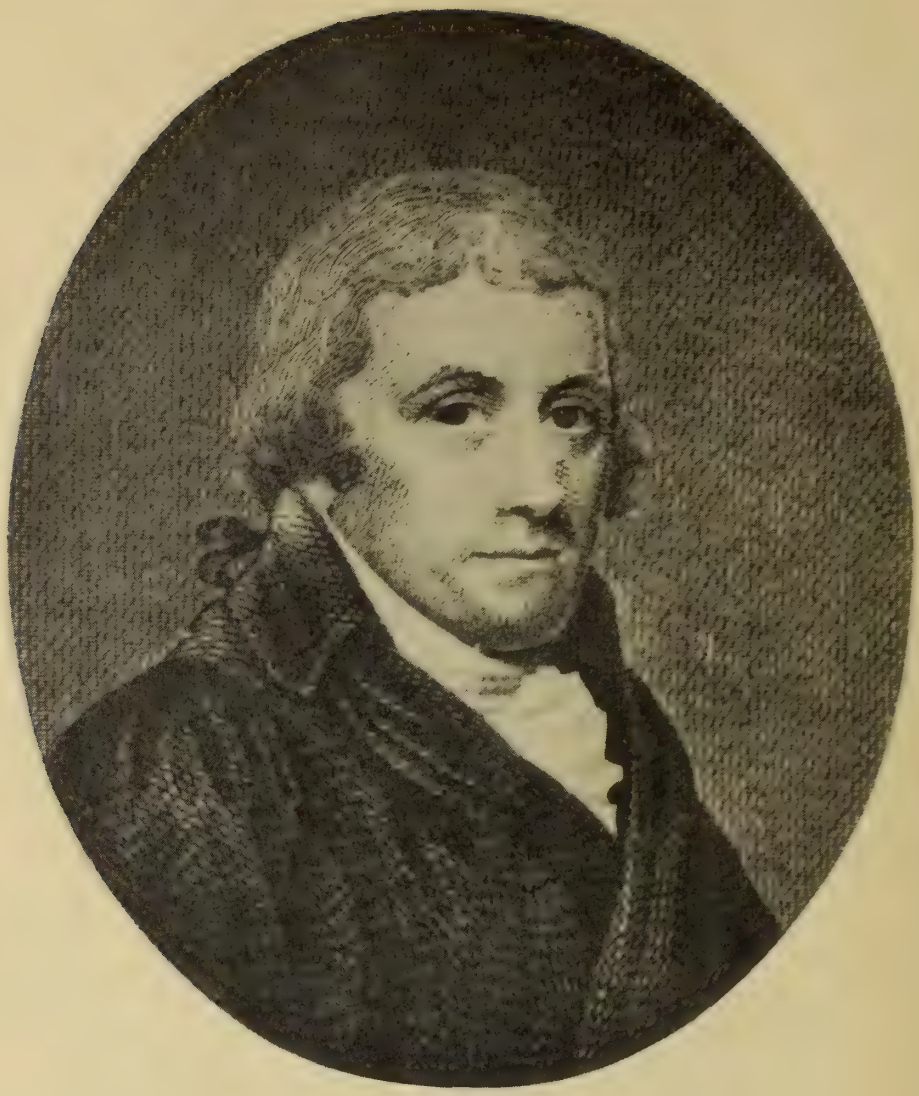
> . . . to introduce pupils of physic and surgery to the bedside of the sick and to all important chirurgical operations, subjected to all those good and wholesome rules established in European hospitals.

Doctor Waterhouse also established an outpatient service so that minor ailments and injuries could be treated without using beds and services needed for the more seriously ill men.

From 1807 to the opening of the Massachusetts General Hospital in 1821, the Marine Hospital was one of the sources of clinical material for the students attending the lectures at the Harvard Medical School, then

(From USPHS Records)

First U. S. Marine Hospital at the Port of Boston, Massachusetts, occupied 1804-1827.



(From "The Jenner of America" by W. M. Welch. Reprinted from the *Proceedings of the Philadelphia County Medical Society,* 1885.)

Dr. Benjamin Waterhouse, in charge of U. S. Marine Hospital, Boston, Massachusetts, 1807-1809.

known as the Massachusetts Medical College of Harvard University. The announcement of the college for the year 1818, which seems to have been the first printed announcement issued, consists of a four-page pamphlet in which it was possible to list the members of the faculty, the names of the students attending the lectures for that year, and the following description of the course of study, facilities, and fees:

MEDICAL LECTURES

The lectures will commence annually on the third Wednesday in November, and continue without any unnecessary omission for three months.

During their residence in Boston the students have opportunities of seeing actual practice, either by entering their names with some physician of the town, or by attending the Alms House, which is usually accessible for a small fee. The physician of the Marine Hospital* has also very liberally invited such as desire it, to attend the practice of that place.

The fees for attendance on the lectures are as follows, Viz:—For the course on Anatomy and Surgery, 20 dollars—Chemistry, and Theory and Practice of Physic, each 15 dollars. Materia Medica and Midwifery, each 10 dollars. Tickets entitling to perpetual attendance may be obtained, by paying in advance for two courses. The Medical Library contains about 5,000 vols.

It is expected that the Massachusetts General Hospital will be opened before the Commencement of another course, by which the advantages for students will be very much increased.

Boston, December 1, 1818.

First Marine Hospital Owned by Government

The first Marine Hospital owned by the Federal Government was purchased from the State of Virginia in 1801 and was located at Washington Point, sometimes called Ferry Point, in Norfolk County. This hospital was erected by the State of Virginia for use by merchant seamen. The hospital was not immediately occupied after purchase; apparently, because it had never actually been completed and was in need of repairs. The transfer deed was signed by Governor James Monroe on April 20, 1801.

*David Townsend, M.D.

After its transfer to the Federal Government, the first medical officer to have charge of the Marine Hospital at Norfolk was Dr. George Balfour in 1801. He was born in Little England, Virginia, in 1771 and entered the Army in 1792, serving with the Third Infantry and Second Sublegion. He was transferred to the Navy in 1798. Doctor Balfour resigned from the Marine Hospital in 1804 and entered private practice in Norfolk where he died in 1830. Doctor Balfour was succeeded by Dr. Philip Barraud. Apparently, both Doctor Balfour and Doctor Barraud served at the Marine Hospital at Norfolk from 1801 to 1804.

Doctor Barraud was born in 1757 and joined the Revolutionary forces while still a youth. After the Revolutionary War he is said to have supplemented his medical education by study at the University of Edinburgh. He served on the Board of Visitors of William and Mary College in 1791 and was visiting physician at the Asylum for four years. He began practice in Norfolk in 1799 and remained there for 30 years. The tenure of office of Doctor Barraud at the Marine Hospital is known to have extended from 1801 to 1806. He may have remained longer. Records are not available from 1806 to 1851.

Following the Civil War, this hospital was not again utilized for hospital purposes. This first Marine Hospital was demolished in 1933 and there remains today nothing on the site to indicate its former use. A new Marine Hospital was erected in Norfolk in 1922.

During the period 1798 to 1804, four Marine Hospitals were authorized to be built in the following order: Norfolk, Virginia; Boston, Massachusetts; Newport, Rhode Island; and Charleston, South Carolina.

The Marine Hospital erected by the Federal Government at the port of Boston in 1802, was located at Charlestown, on the east bank of the Mystic River. It was a two-story brick building, 100 feet by 40 feet, having 19 rooms, and was the first general hospital erected in Boston, preceding in time the Massachusetts General Hospital, which was occupied in 1821. The Marine Hospital for the port of Boston was authorized by an act approved May 3, 1802, appropriating $15,000 for that purpose. This Act also authorized the treatment of foreign seamen in Marine Hospitals and reimbursement for this service by the country concerned.

New Orleans Marine Hospital Authorized

This same Act required masters of boats, rafts, and similar craft going to New Orleans down the Mississippi River to render true accounts of the persons employed on board and to pay a hospital tax of 20 cents a month for each such person. The master of the vessel was authorized to retain these funds out of the wages of such persons for payment to the Collector of Customs. Also included in that Act was authority for the President to appoint a director of the Marine Hospital at New Orleans, where a United States Collector of Customs had already been appointed. This port, being at that time under French rule, had a large and increasing traffic with the United States. In 1801 about 200 American vessels entered New Orleans by sea, and from 350 to 400 vessels came down the Mississippi River. The report referring to this matter mentions an average crew of eight men for ships entering by sea and four men for those coming down the river. The river craft entering the port of New Orleans were required to pay the hospital money at Fort Adams.

Dr. William Bache, a grandson of Benjamin Franklin, in 1803 was the first physician to provide medical care to merchant seamen under the Act at New Orleans. He was succeeded by Dr. William Barnwell of Philadelphia who was directed on May 3, 1804, to purchase in that city the necessary supplies and equipment for use in New Orleans to provide care for merchant seamen. The Collector of Customs at Philadelphia was directed to pay the bills for these supplies and equipment and to advance one quarter's salary to Doctor Barnwell. His salary was $1,000.00 per annum to be paid quarterly. On April 15, 1807, Doctor Barnwell was replaced at New Orleans by Doctor Blanquet as the medical officer for treating sick and disabled merchant seamen.

Medical Care for Seamen, Charleston, South Carolina

The Hospital at Charleston, South Carolina, referred to by the Secretary of the Treasury in a report dated February 16, 1802, was not a government hospital. Secretary of the Treasury Albert Gallatin, in June, 1802, suggested to the City Council of Charleston that it take charge of such sick and disabled seamen as might apply for medical relief at that

place, for which it would receive the hospital dues collected at their port and $15,000 out of the general fund for the erection of a Marine Hospital. The proposal was accepted on November 2, 1804, with the provision made on the part of the Council that the city should be allowed to levy a tonnage duty on vessels to supply any deficiency that might result from building and maintaining the hospital. The City Council assumed the charge of sick and disabled seamen at the port of Charleston in April, 1805, and a year later Congress gave its assent to an Act of the legislature of South Carolina imposing a tonnage tax of six cents on vessels entering Charleston from any foreign port. This tax was later increased to 10 cents. A Marine Hospital was opened at Charleston, South Carolina, in 1834. This hospital was sold at public auction in 1866.

At ports where hospitals had not been built, contracts were made with private hospitals and boarding houses to provide the most adequate available care for Service beneficiaries.

The following table obtained from old records indicates by years the number of American seamen registered as having received "protections" from 1796 to 1812. The term "protections" apparently means medical treatments.

Years	*Number*	*Years*	*Number*
1796	4,849	1805	10,722
1797	9,021	1806	9,900
1798	7,031	1807	7,937
1799	6,514	1808	1,121
1800	3,390	1809	9,170
1801	6,917	1810	3,668
1802	891	1811	4,828
1803	10,724	1812	3,252
1804	6,822		

The treatments given to seamen prior to the establishment of the Marine Hospital Service must have been furnished through the State marine hospital at Norfolk and other cities, as is known to have occurred at Charleston, South Carolina.

Naval Hospital Fund Established

The collection of 20 cents a month from the pay of officers and men of the Navy, by the Act of February 26, 1811, became a function of the Navy, and the funds were utilized for the Naval Hospital Fund. This deduction of 20 cents a month from the pay of officers and men of the Navy and Marine Corps continued through the years until World War II, when it was finally repealed by the Act of June 15, 1943.

The Act approved February 26, 1811, also required that hospitals be established for the care of officers and men of the Navy. A separate fund was constituted and a Board of Commissioners appointed. The Secretary of the Navy was required to prepare necessary rules and regulations. The Commissioners appointed consisted of the Secretary of the Navy, Secretary of the Treasury, and the Secretary of War. They were known as the "Commissioners of Naval Hospitals." The plan for building naval hospitals met with opposition from two of the Commissioners—the Secretary of the Treasury and the Secretary of War. As a result, no naval hospital was built at that time.

In 1817 the Secretary of the Navy reported that early in 1812 several surveys had been made and that the Commissioners had met, but that the subsequent events of the war stopped all further proceedings until after peace was declared. Authority was then provided by Congress for the Navy to proceed with the construction of its own hospitals.

In a report to Congress made February 27, 1830, by the Secretary of the Treasury Samuel D. Ingham, it was stated that no hospital tax had been collected from seamen in the lake ports up to that time but that instructions had been given to insure its collection thence-forward.

Funds Collected from Seamen Insufficient

For nearly 40 years after the establishment of the Marine Hospital Service the expense attending the care of sick and disabled seamen had to be met alone from the fund created by the tax upon all seamen. The demand for relief far exceeded the funds available, and during that time few deficiency appropriations were made by Congress. Hence, various restrictions were imposed from time to time to keep the disbursements

within the amount of the fund. Seamen affected with chronic or incurable conditions were excluded from medical relief and those admitted to its benefits were those expected to be able to return to duty in a short time. In no case was care allowed to extend beyond a period of four months.

The tax of 20 cents a month to be deducted from the wages of seamen, provided by the original Act, proved to be inadequate to meet the demands for service to merchant seamen. It was necessary for Congress to appropriate funds for the construction of all the Marine Hospitals. From time to time Congress also had to supplement by appropriations the funds collected from the seamen in order to meet current expenses. These supplemental funds varied from $1,000 to $275,000 annually. From 1798 to 1873 supplemental appropriations by the Congress to provide care for merchant seamen totaled $4,830,944.34, exclusive of funds provided by the Congress for construction of new Marine Hospitals.

Nearly every letter from the Treasury Department written during the above period and later, in relation to medical relief, enjoined Collectors of Customs to keep expenditures of the funds to the lowest point.

Dr. John Gorrie

In 1833 a contract was entered into with Dr. John Gorrie by the Collector of Customs at Apalachicola, Florida, to provide medical care for merchant seamen. Doctor Gorrie continued in charge of the work of the Marine Hospital Service at Apalachicola for several years. A large, three-story, brick building was known to the citizens of the town as the "Marine Hospital." There are no records indicating that a Marine Hospital was built at Apalachicola from Federal funds. It is probable that the designation "Marine Hospital" for this building arose from its use as a contract hospital for merchant seamen and the fact that hospitals for seamen at other ports where hospitals had been built for this purpose from Federal funds were known as Marine Hospitals, irrespective of whether or not they had been built from Federal funds.

It is interesting to note that the process for the manufacture of artificial ice was devised and perfected by Dr. John Gorrie. This innovation was at the time not only a boon to the hospitals and the sick but a

great contribution to the comfort of the well, especially where natural ice was not easily available. Doctor Gorrie's first public demonstration of this new procedure was in 1850, although apparently he made ice as early as 1844. Patent No. 8080 was granted to him on May 6, 1851, and is said to be the first United States patent on mechanical refrigeration.

Doctor Gorrie received his medical degree from the College of Physicians and Surgeons, New York City (now part of Columbia University), in 1833.

Developments Toward the West

With the development of commerce on the "western waters," meaning the Great Lakes and large rivers, the extension of facilities for the treatment of merchant seamen became necessary. An Act approved March 3, 1837, authorized the President to detail three medical officers of the Army to select sites for Marine Hospitals at New Orleans, Mobile, and various places in the Mississippi River Valley. The Secretary of War detailed for this duty Surgeon B. F. Harney, and Assistant Surgeons H. F. Heiskell and J. M. Cuyler. The board assembled at Baton Rouge, Louisiana, on June 18, 1837, and received instructions from Surgeon General Thomas Lawson of the Army authorizing it to select and purchase sites for the Marine Hospitals on the shores of the western waters and to execute contracts for deeds subject to the approval of the Secretary of War. This board selected and purchased sites ranging from eight to 18 acres on the Mississippi River at Natchez, Mississippi; Napoleon, Arkansas; St. Louis, Missouri; on the Ohio at Paducah, Kentucky; Louisville, Kentucky; Wheeling (now West Virginia); and at Cleveland on Lake Erie.

The inhabitants of Pittsburgh apparently did not agree with the recommendations of the board for a hospital at Wheeling, and felt that the hospital should be located in their city. A second board appointed later reported in favor of Pittsburgh, where a Marine Hospital was subsequently erected.

As the population moved west and American shipping followed, treatment facilities were established to serve the seamen. There was once a Marine Hospital at Burlington, Vermont, when Lake Champlain was

thronged with American vessels. The Erie Canal was opened in 1825, and the Great Lakes became an avenue for western migration. By 1850, there were 140 steam and 700 sailing vessels on the Great Lakes, and a regular line of 16 steamboats running from Buffalo to Chicago. The first boat from Buffalo, in 1836 brought 700 passengers to Chicago, and in 1845 ships carried 200,000 people across the Lakes, sometimes 1,500 being landed from a single ship.

In 1838, 5,000 people left Buffalo in a single day bound "up the Lakes to stay," and during that summer settler's wagons left Detroit for the interior at frequent intervals between dawn and dusk each day. New Marine Hospitals or other treatment stations were established for seamen at Buffalo, Cleveland, Chicago, Pittsburgh, Detroit, and various other posts as shipping increased.

In 1837, Mr. Robert Mills, an architect, prepared standard plans for the Marine Hospitals that apparently were followed without material change down to the second Marine Hospital constructed at Chicago in 1872. The illustration facing page 45 is a reproduction of the design by Mr. Mills for a Marine Hospital to accommodate 100 patients. Similar standard plans were prepared for a Marine Hospital for 50 patients.

Erection of the hospitals recommended by the board of Army medical officers was delayed until the funds were appropriated by the Act approved August 29, 1842. The construction of the Marine Hospitals during this period was under the supervision of officers of the Corps of Topographical Engineers of the Army, now the Corps of Engineers. The Marine Hospitals erected at Chicago, Illinois; Paducah, Kentucky; Napoleon, Arkansas; and Natchez, Mississippi; were constructed under the direction of Colonel J. J. Abert, Chief of the Corps of Topographical Engineers, at that time. The Office of the Supervising Architect of the Treasury Department was not established until 1853.

Commission for Examining Marine Hospitals Established

An Act approved March 3, 1849, authorized the Secretary of the Treasury:

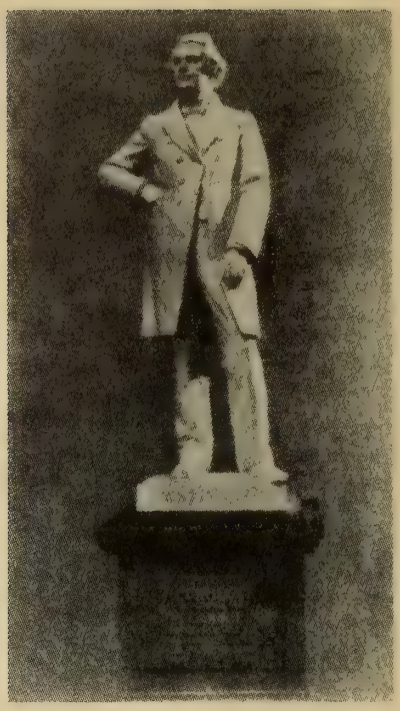
> . . . to collect facts and information in relation to marine hospitals and the marine hospital fund and to report to Congress what alteration and improvements are necessary and practicable in the administration of same.

(From USPHS Records)

Mortar and pestle from the basement of the first Marine Hospital, Boston, Massachusetts.

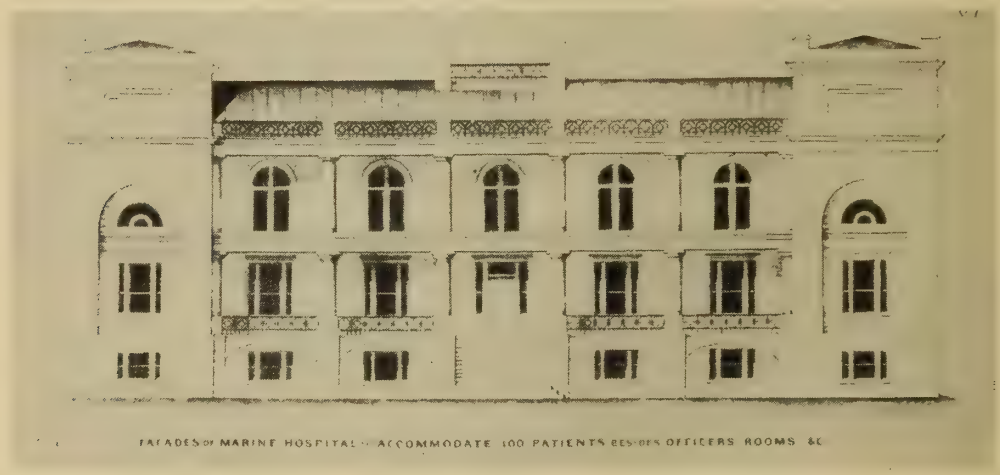
(From USPHS Records)

The first Marine Hospital owned by the Marine Hospital Service located at Norfolk, Virginia, was purchased from the State of Virginia in 1801. The building was originally constructed without the porch and columns, which were added many years later.



(From Prints and Photographs, Library of Congress)

Statue of Dr. John Gorrie in Statuary Hall, U. S. Capitol. Dr. Gorrie devised the first successful method for manufacturing artificial ice about 1840. He was in charge of the work of the Marine Hospital Service at Apalachicola, Florida, for several years, beginning about 1833.



(From USPHS Records)

Standard plans prepared by Mr. Robert Mills, Architect, in the early 1830's, for construction of Marine Hospitals.

In compliance with this Act, Dr. George B. Loring, Surgeon of the Marine Hospital at Boston, Massachusetts, and Dr. Thomas O. Edwards of Lancaster, Ohio, later Member of Congress from Ohio, were appointed as a "commission for examining marine hospitals." Their report was submitted to Secretary of the Treasury William N. Meredith on October 1, 1849, but it was not presented to Congress until transmitted by Secretary of the Treasury Thomas Corwin on January 17, 1851, in answer to a resolution of the Senate.

This commission for examining Marine Hospitals made an inspection of hospitals then in operation and in process of construction. They stated that the "condition, internal arrangement and expense of the hospitals already in operation vary with their number and location," and "neither in form nor character has any uniformity in their arrangement been observed." Then the commission proceeded to the consideration of individual hospitals and made recommendations appropriate to the local situation of each one. The commission reviewed the local regulations for the several hospitals and stated the greatest existing defect to be that "no method of government and internal regulations has been entered upon which would render them parts of a uniform whole," and "in order that suitable professional information may control the system and give it a position as it deserves," they proposed that the hospitals be placed under the control of a "chief surgeon who shall have his bureau attached to the Treasury Department." The "regulations which are to govern the hospitals should emanate from him."

Certain other details from the report are of interest. The staff of the hospital at Boston consisted of 14 positions: surgeon, steward, matron, six nurses and attendants, two laborers, two cooks, one laundress. The surgeon received $1,000 per annum and house rent; the steward received $500 per annum. During the year ended December 31, 1848, 1,146 patients were treated at the Boston Marine Hospital and each patient was in the hospital an average of 25 days, giving an average of about 79 patients in the hospital per day.

Hospital Established on West Coast

In April, 1851, the legislature of California passed an Act establishing a State Marine Hospital in San Francisco. This hospital was built

on Filbert Street between Stockton and Powell Streets. On September 30, 1850, Congress appropriated $50,000 for a Marine Hospital in San Francisco, and it was built in 1853 on what is now the corner of Spear and Harrison Streets.

While the hospital was under construction the Revenue Cutter *Polk* was used as a floating hospital for the care of seamen, being anchored for this purpose near Fort Mason.

Marine Hospital Regulations Revised

At the Treasury Department in Washington the matters relating to Marine Hospitals were handled by a person designated as "marine hospital clerk." Regulations for the government of Marine Hospitals, prepared in 1852, following the Loring-Edwards report, were revised and published in 1856, and made effective October 25, 1856. These regulations were subsequently embodied in the general regulations under the Revenue and Collection laws of the United States which laws were then, in accordance with a resolution of the Senate, undergoing revision for the first time since 1798. Secretary of the Treasury James Guthrie in his annual report for 1856 states:

> It has been considered necessary to give new instructions, as to the collection and proper accounting for the hospital funds, the provisions, medicines, and other supplies, the employment of stewards, nurses and other servants and the government and supervision of the hospitals. These publications have been published and are now being enforced. They will be found in the revised code of circular instructions heretofore mentioned.

During the war between the States the Marine Hospitals in the States that seceded, with the exception of two in Florida, were occupied by the Confederate forces and utilized as military hospitals. The Marine Hospitals in the territory under the control of the Union troops were used as necessary in providing care for soldiers, sailors, and American seamen.

Reorganization of Service

During the year 1869, Dr. W. D. Stewart, who had served during the Civil War as surgeon of volunteers in the U. S. Army, was appointed an Inspector of Marine Hospitals for the Treasury Department, and later Dr. John S. Billings of the Army was associated with him in this work.

In January 1870, a bill for the reorganization of the Marine Hospital Service was transmitted by Secretary of the Treasury George S. Boutwell to the President of the Senate. The essential changes proposed by this bill had already been foreshadowed in the Edwards-Loring report. This bill for the first time provided for a centralization of administration of the Marine Hospitals as a Bureau of the Treasury Department. This bill encountered no material opposition in the House or the Senate and received favorable action, becoming law on June 29, 1870.

With the appointment of Dr. John M. Woodworth as the Supervising Surgeon there began the development of the central control of the Marine Hospitals. As maritime commerce expanded and developed throughout the ports of the Nation, additional Marine Hospitals were built and outpatient offices were opened to meet the medical care needs of merchant seamen. From time to time new hospitals were constructed when the old structures had become outmoded and no longer served their purpose. In some ports like Boston, New York, New Orleans, and San Francisco, several different hospital structures have been erected during the span of years over which medical care has been provided for merchant seamen.

The reorganization Act of 1870 increased the amount of hospital tax to be deducted from the wages of merchant seamen to 40 cents a month. In 1884 the tax was abolished. The cost of maintaining the Marine Hospitals was then paid out of a tonnage tax, which in normal times amounted to about $2,000,000 a year, and this continued until 1906. Since that date the medical care for merchant seamen and other beneficiaries of the Service has been supported by direct appropriations by the Congress.

Beneficiaries

Beginning with the Act of July 16, 1798, "for the relief of sick and disabled seamen," the designation of beneficiaries for treatment by the Public Health Service has been a matter of general evolution. The benefits of this Act were extended by the Act of March 2, 1799, to officers and men of the Navy and they continued as specific beneficiaries until 1818. The early regulations of the Service provided that only those

persons whose wages were assessed for hospital dues were eligible for medical care.

Admission of foreign seamen to Marine Hospitals on a reimbursable basis has been authorized since May 3, 1802.

Not until the Act of June 29, 1870, was the class of seamen to be accommodated limited to "seamen employed in registered, enrolled, and licensed vessels of the United States." The Act of March 3, 1875, provided for the accommodation of seamen of vessels other than registered, enrolled and licensed vessels of the United States, under such regulations as the Secretary of the Treasury may prescribe.

Under the broad provisions of the Act of March 3, 1875, the regulations authorized admission of Navy seamen and seamen of other Government Services at rates fixed by the Secretary of the Treasury; officers and seamen of the Revenue-Cutter Service (now Coast Guard) were admitted without charge as they were subject to payment of hospital dues. The following beneficiaries in addition to seamen were admitted for care under the 1897 regulations, without charge, and were later covered in specific statutes (dates indicated in parentheses): Officers and crews of the Light-House Establishment (August 28, 1916; March 3, 1919; May 22, 1926, later consolidated with the Coast Guard); seamen employed on vessels of the Mississippi River Commission (March 3, 1919); seamen employed on vessels of the Engineer Corps of the Army (March 3, 1919); keepers and crews of the United States Life-Saving Service (August 4, 1894, later consolidated with Coast Guard); officers and crews of vessels of Coast and Geodetic Survey (March 3, 1919; April 26, 1939).

The Coast Guard was established by the Act of January 28, 1915, in lieu of the existing Revenue-Cutter Service (formerly the Revenue Marine Service) and the Life-Saving Service. The beneficiary classification of personnel from these two services was then changed to that of Coast Guard.

The Act of March 3, 1919, included Coast Guard officers and enlisted men in the list of beneficiaries of the Public Health Service. The Act of May 18, 1928, extended medical and hospital care to retired officers and retired enlisted men. The Act of July 30, 1937, had the effect of codifying prior statutes relating to medical care for Coast Guard personnel.

Custom - House, Boston

for The bearer is entitled to the

privileges of the **MARINE HOSPITAL.**

(From USPHS Records)

Form used before Civil War by the Collector of Customs, Boston, Massachusetts.

(From USPHS Records)

The first Marine Hospital built in San Francisco, located at the foot of Rincon Hill, was completed in 1853 from special funds appropriated by Congress. In 1876 the hospital was leased to the city and county of San Francisco for use as a "Sailor's Home." The building was torn down in the late 1920's. This photograph was made in 1897.

At that time dependents of such personnel were included as legal beneficiaries of the Service. The Lighthouse Service was transferred to and consolidated with the Coast Guard by reorganization Plan No. II effective July 1, 1939. Civilian personnel of the former Lighthouse Service who were not militarized under the Coast Guard and retired Lighthouse personnel having eligibility under former statutes retained their eligibility under the Public Health Service Act of July 1, 1944.

Under the Act of October 6, 1917, beneficiaries of the War Risk Insurance Bureau of Treasury Department were admitted to facilities of the Public Health Service. The Bureau of War Risk Insurance was later transferred by Act of August 9, 1921, to the newly created Veterans' Bureau (now Veterans' Administration). Since 1921, beneficiaries of the Veterans' (Bureau) Administration have been admitted to hospitals of the Public Health Service on a reimbursable basis.

Officers and crews of the several vessels belonging to the Bureau of Fisheries (now Fish and Wildlife Service) have been admitted since the Act of July 1, 1918, to the benefits of the Public Health Service without charge.

In 1902 the regulations provided that seamen employees on Army transports, and other vessels of the U. S. Army, who were not officers or enlisted men of the Army, were entitled to benefits of the Service. These persons were also included in the Act of March 3, 1919. Civilian seamen employed on vessels of the United States Government of more than five tons burden and seamen employed on State School Ships were designated as beneficiaries by Act of March 21, 1936.

In 1916 the United States Employees' Compensation Act was passed and persons eligible for treatment or hospitalization under that Act, and its amendments, have since been admitted to facilities of the Service.

Medical officers of the Public Health Service were designated as beneficiaries by regulation in 1902. Subsequently, commissioned officers and those employees of the Public Health Service devoting all their time to field work when taken sick or injured in line of duty became legal beneficiaries by the Act of June 23, 1913. The Act of March 3, 1931, extended medical care benefits to officers and employees of the Service on duty at any national quarantine station, national quarantine vessel or detailed for duty in foreign ports. The Public Health Service Act of July

1, 1944, included retired commissioned officers as well as those on active duty.

Medical and hospital services were provided for dependents of commissioned officers of the Public Health Service by regulation beginning in 1931; dependents of members of the Coast Guard and Coast and Geodetic Survey were made beneficiaries under the Acts of July 30, 1937, and April 26, 1939, respectively. These groups of dependents were included in the Public Health Service Act of 1944. Outpatient care at stations of the Service is provided without charge; hospitalization at hospitals of the Service is furnished at a rate established by the President.

Enrollees of the Maritime Service and members of the Merchant Marine Cadet Corps and seamen employed on United States or foreign flag vessels as employees of the United States through the War Shipping Administration became beneficiaries under the Public Health Service Act of 1944.

Patients for special study have been admitted to hospitals of the Service since the Act of March 3, 1911. Until the passage of the Public Health Service Act of July 1, 1944, such admissions were limited to 10 cases in any one hospital at one time.

For many years persons detained under the Immigration Laws have been admitted to hospitals of the Service. The Public Health Service Act of July 1, 1944, provides that reimbursement for such care shall be made by the Immigration and Naturalization Service.

Under the temporary wartime provisions of the Public Health Service Act of July 1, 1944, seamen employed on foreign-flag vessels owned or operated by citizens or corporations of the United States were entitled to medical care, without charge, the same as for seamen on United States vessels.

From January 1, 1944, through the fiscal year ended June 30, 1948, active duty personnel of the Navy and Marine Corps were given medical and hospital treatment in marine hospitals and outpatient offices, without charge. The authority to admit such personnel during this period was a temporary arrangement entered into during World War II. At other times admission is accomplished pursuant to reimbursement agreement with the Navy.

A special Act in 1917 authorized the establishment of a National Leprosarium and thus made persons afflicted with leprosy beneficiaries of the Service. A hospital for the treatment of these patients was established at Carville, Louisiana, in 1921. The Act of July 1, 1944, provided for treatment of such patients at any hospital of the Service suitable for such purpose.

The first effort to obtain authority for such a hospital was defeated by a prominent member of the House of Representatives. He used ridicule by playing on the word leprosarium. He said, for example, that the next thing would be "syphilarium." The bill was defeated at that time. Little did that member of Congress think that within a generation, rapid treatment centers for venereal diseases would be established by the Public Health Service under authorization of the Congress.

Hospitals for Narcotic Addicts

Recognizing the importance of the problem of drug addiction, authority was granted by Congress in 1929 for the construction of two hospitals devoted to the care and treatment of persons addicted to the abusive use of narcotic drugs. This action followed an international conference held in Geneva, Switzerland, in 1925, for controlling the international and domestic traffic in opium. A conference in 1931 dealt with limiting the manufacture of narcotic drugs to the world's medical and scientific needs. A treaty concerned with the control of opium along that line was ratified in 1931. Congressman Stephen G. Porter of Pennsylvania was the moving spirit in this achievement. Dr. Rupert Blue of the Service was a delegate and the professional adviser of the United States delegation. These institutions are used for the treatment of Federal prisoners who are drug addicts, as well as any citizens who may voluntarily submit themselves for treatment. Those financially able are required to pay. Some general neuro-psychiatric beneficiaries are also given treatment in these institutions.

The Act authorizing the two hospitals for the treatment of narcotic addicts created within the Public Health Service an administrative division called the Narcotics Division which was charged by law with the administration of the two hospitals for the treatment of narcotic addicts;

with studies of the nature of drug addiction and the best methods of treatment and rehabilitation of persons addicted to habit-forming drugs; with the dissemination of information on the best methods of treatment and research; and with cooperation with State and local jurisdictions with a view to developing facilities for the care and treatment of narcotic addicts.

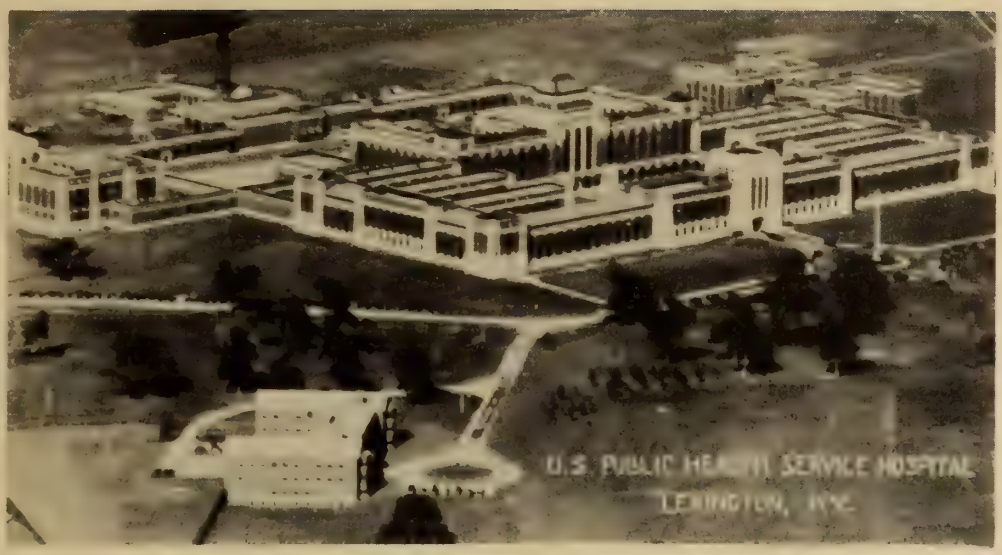
Upon the establishment of the Narcotics Division in 1930, Dr. Walter L. Treadway was placed in charge. The name of this Division was later changed to the Mental Hygiene Division. The Mental Hygiene Division was abolished in 1949 and in its stead was created the National Institute of Mental Health as authorized by the National Mental Health Act of 1946.

The location, planning, and construction of the two hospitals for the treatment of narcotic addicts, as well as the formulation of policies for the medical service of the Federal prison system and planning of the Medical Center for Federal Prisoners at Springfield, Mo., was the responsibility of the Narcotics Division. This work was handled by Dr. Walter L. Treadway, a competent psychiatrist and able administrator.

The institution at Lexington, Kentucky, was formally dedicated and opened by Surgeon General Hugh S. Cumming on May 25, 1935. Dr. Lawrence Kolb was the first Medical Officer in Charge there. The institution at Fort Worth, Texas, was opened in 1938, with Dr. William F. Ossenfort as the first Medical Officer in Charge.

Major Building Program Inaugurated

Through the untiring efforts of Dr. Frederick C. Smith, Chief of the Hospital Division 1923-1933, a major building program was planned and begun in the late 1920's and the early 1930's. This program was completed during the decade ending about 1940. There was entire new construction at Baltimore, Boston, Cleveland, Detroit, Galveston, Kirkwood (Missouri), New Orleans, San Francisco, and Seattle. New hospital buildings were constructed at Louisville and Staten Island, and other hospitals acquired new wings or other additions. During this period, both equipment and hospital procedures were modernized to conform with approved practices, and the Marine Hospitals came to be

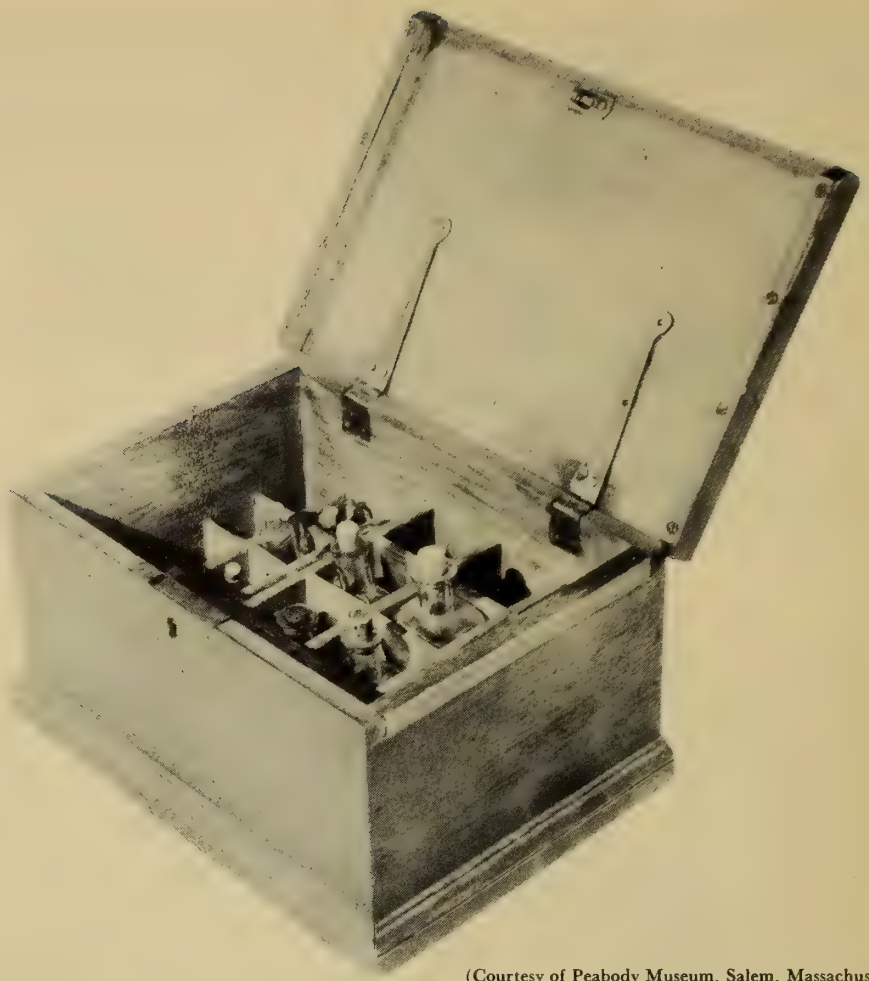


(From USPHS Records)

U. S. Public Health Service Hospital, Lexington, Kentucky, 1950.

(From USPHS Records)

U. S. Marine Hospital, Seattle, Washington, 1950.



(Courtesy of Peabody Museum, Salem, Massachusetts)

Ship's Medicine Chest used by sailing vessel about 1830.

recognized as ranking among the best institutions in their respective localities.

Medical Care Activities 1950

At the present time the Service operates 24 hospitals, 19 outpatient clinics (full-time Public Health Service staff), and 103 outpatient offices (contracts with local physicians where the volume of work does not justify a Service hospital or outpatient clinic). The hospitals now operated by the Service vary in size from 30 beds at Vineyard Haven, Massachusetts, to 1,400 beds at Lexington, Kentucky. The over-all total beds operated by the Service is about 8,170.

The following table lists the Service hospitals that are now in operation (1950), their locations, the current bed capacities, and the dates the present principal buildings were constructed.

Location	*Bed Capacity 1950*	*Present Building Constructed*	*Remarks*
Baltimore, Maryland	508	1934	
Boston, Massachusetts	338	1940	
Carville, Louisiana (Leprosy patients)	450	1921	Infimary building constructed in 1935
Chicago, Illinois	227	1873	Four-story wing constructed in 1935
Cleveland, Ohio	254	1930	
Detroit, Michigan	242	1930	Extension built in 1933
Ellis Island, New York	391	1898	Belongs to Immigration and Naturalization Service
Fort Stanton, New Mexico (Tuberculosis)	242	1936	
Fort Worth, Texas (Drug addicts and other neuropsychiatric patients)	1,000	1935	
Galveston, Texas	207	1931	
Kirkwood, Missouri	163	1939	

Location	*Bed Capacity 1950*	*Present Building Constructed*	*Remarks*
Lexington, Kentucky (Drug addicts and other neuropsychiatric patients)	1,400	1933	
Manhattan Beach, New York (Tuberculosis)	285	1942	
Memphis, Tennessee	171	1884	New surgical ward building constructed in 1934
Mobile, Alabama	145	1841	New ward building constructed in 1933
New Orleans, Louisiana	523	1931	
Norfolk, Virginia	356	1922	Extensive additions in 1934
Portland, Maine	80	1859	Complete remodeling in 1935
San Francisco, California	483	1931	
San Juan, Puerto Rico	82	1942	
Savannah, Georgia	180	1906	New wing constructed in 1918
Seattle, Washington	478	1933	
Staten Island, New York	878	1935	Extension constructed in 1940
Vineyard Haven, Mass.	30	1895	

Outpatient clinics now in operation (1950) are as follows:

Balboa Heights, Canal Zone
Buffalo, New York
Charleston, South Carolina
Charlotte Amalie, Virgin Islands
El Paso, Texas
Honolulu, Hawaii
Houston, Texas
Los Angeles, California
Louisville, Kentucky
Miami, Florida
New York, New York
Philadelphia, Pennsylvania
Pittsburgh, Pennsylvania
Port Arthur, Texas
Portland, Oregon
San Diego, California
San Pedro, California
Tampa, Florida
Washington, D. C.

Marine Hospitals were formerly operated at the locations listed below. These hospitals were closed in the years indicated. A decrease of merchant seamen in a given port to the extent that an insufficient number of patients were available was the usual reason for closing these hospitals.

Location	*Year Closed*
Delaware Breakwater (Lewes, Delaware)	1903
Dutch Harbor, Alaska	1903
Cincinnati, Ohio	1905
Wilmington, North Carolina	1917
Cairo, Illinois	1922
New York, New York (67 Hudson Street). Continued as an outpatient office	1925
Port Townsend, Washington	1933
Key West, Florida (Entrusted to Navy)	1943
Louisville, Kentucky	1946
Evansville, Indiana	1947
Buffalo, New York	1949
Pittsburgh, Pennsylvania	1949

The above list does not include several of the small Marine Hospitals that were built at various times before the Civil War, some of which either were not used or were used for only a short time because of changes of merchant marine traffic on the midwestern rivers.

Ship's Medicine Chest

An Act of Congress approved July 20, 1790, provided that a medicine chest arranged by a reputable apothecary be placed on each American flag vessel of 150 tons and upward which was navigated by 10 or more persons. The legislation specified also that each chest have with it a set of directions for the administering of each item. The first edition of *The Ship's Medicine Chest and First Aid at Sea,* as we know it today, was prepared by the Marine Hospital Service in 1881 for use aboard ships that did not carry a physician. Since then, the handbook has been revised and rewritten several times, to bring it up to date in terms of improved care of the sick and advances in modern medical knowledge.

Proficiency in first aid has long been required as a qualification for masters, mates, and other licensed officers on American merchant vessels. Medical officers of the Public Health Service customarily give applicants for license as officers of the American Merchant Marine the necessary instructions in first aid, examine them at the conclusion of the course, and certify to their training and proficiency in first aid.

The current edition of *The Ship's Medicine Chest and First Aid at Sea* describes in simple, non-technical terms the anatomy of the human body and the functions of the various organs. It furnishes guidance for the treatment and after-care of the diseases and emergencies most frequently met at sea. Considerable space is devoted to preventive medicine, personal hygiene, and sanitation afloat. Specific instructions for requesting medical advice by radio are given in detail. The closing chapter concerns procedures incident to births and deaths at sea.

The current volume was prepared by Dr. Justin K. Fuller during the time that he was Chief Medical Officer of the Maritime Service in World War II. It was printed in 1947.

Medical Advice by Radio

The plan for giving medical advice by radio to masters of vessels on the high seas was suggested in 1921 by Captain Robert Huntington, Principal of the Merchant Marine School of the Seamen's Church Institute in New York.

Seagoing vessels are required by law to be equipped with standard medicine chests. This standardization of medicine chests facilitates the giving of medical directions by radio to ships at sea.

Since 1925 the Public Health Service has furnished medical advice by radio to ships at sea. Any vessel not carrying a physician, that has sickness on board, can get in touch with designated Marine Hospitals of the Service by radio, describe the illness aboard, and receive medical advice from time to time as needed.

Within recent years medical advice by radio to ships at sea has become such a commonplace practice that it is now considered to be routine. When this plan was first inaugurated, many letters of appreciation were received by the Public Health Service from patients who had been treated in accordance with instructions by radio as well as from ships' officers upon whom fell the responsibility of supervising the care of sick persons on their vessels.

Headquarters Reorganization

The reorganization of the Public Health Service following the Acts of November 11, 1943, and July 1, 1944, necessitated some reorientation

and reorganization of constituent units. In the Division of Hospitals, reorganization followed a survey carried on in the late winter and spring of 1945. To build the new structure at Headquarters, professional and managerial activities were broken down into functions which were then regrouped on the basis of similarity. Certain aspects of the field program were singled out for special study and development, principally in the areas of dietetics, nursing, social service, hospital plant maintenance, physical medicine and rehabilitation, pharmacy, hospital administration, and the training of medical and dental officers.

Medical and Dental Interns

The use of interns and residents in Marine Hospitals was inaugurated by Dr. Benjamin Waterhouse in 1807 at the Marine Hospital in Boston. Doctor Waterhouse kept a "senior pupil or a well instructed medical young gentleman constantly residing, day and night, in the house." Since World War II with the attendant critical shortage of medical and dental officers, the policy of providing internships in Service hospitals has continued as a recruitment and training measure. The current internships and residencies offered in Service hospitals compare with those to be obtained anywhere in the United States.

Since the reorganization of the Service in 1870, the Marine Hospitals have been the principal means of attracting and recruiting physicians into the Service. For many years it was the practice to rotate recently-appointed medical officers through a variety of different types of duty, so that they might become familiar with the several functions and activities of the Service. In this way it was possible to develop a corps of medical officers experienced in the various phases of medical and public health administration.

Although interns have been used in Service hospitals for many years, it was not until about 1930 that special attention was given to their selection and training. Since that time, the Service has appointed medical and dental graduates for one year of internship in the larger Marine Hospitals. A large proportion of the present medical and dental officers served their internships in hospitals of the Service before entering the Corps. Until about 1946, in the case of the medical internships, and

1948, in the case of the dental internships, this training was carried out primarily on a preceptorship basis, that is, the medical and dental interns learned by observing the work of senior officers with whom they were assigned. While many of the senior officers took a good deal of time and trouble to teach the interns, there was no formal or organized program of intern training.

Approved Residencies and Internships Established

After World War II, it became obvious that changing standards of medical and dental education throughout the country required the development of more intensive internship training. Such programs were worked out in both medicine and dentistry, and, on the basis of these programs, 11 hospitals are now (1950) approved by the Council on Medical Education and Hospitals of the American Medical Association for the training of medical interns, and nine hospitals are approved by the American Dental Association for the training of dental interns.

As part of the postwar education developments, consideration was also given to the training of medical specialists. Whether one liked the trend of events or not, it became obvious that young physicians were going to demand specialized training to a greater degree and in greater numbers than before the war. Partly to take account of this situation and partly to develop trained specialists to staff Service hospitals, the Division of Hospitals, beginning about 1945, developed approved training programs in all of the principal medical specialties, except obstetrics, gynecology, and pediatrics. At the same time, the Division of Mental Hygiene put on a more formal basis the training in psychiatry which it had been carrying out for several years at the two U. S. Public Health Service Hospitals at Lexington, Kentucky, and Fort Worth, Texas. Since July 1, 1949, when the Division of Hospitals was given responsibility for these two hospitals, the training program in psychiatry has been integrated with training in other specialties. At the present time (1950), 11 of the hospitals are approved by the Council on Medical Education and Hospitals of the American Medical Association for specialty training in one or more of the medical specialties. Plans for the future include development of formal training programs in several of the dental specialties.

CUSTOM HOUSE OFFICE.

Return

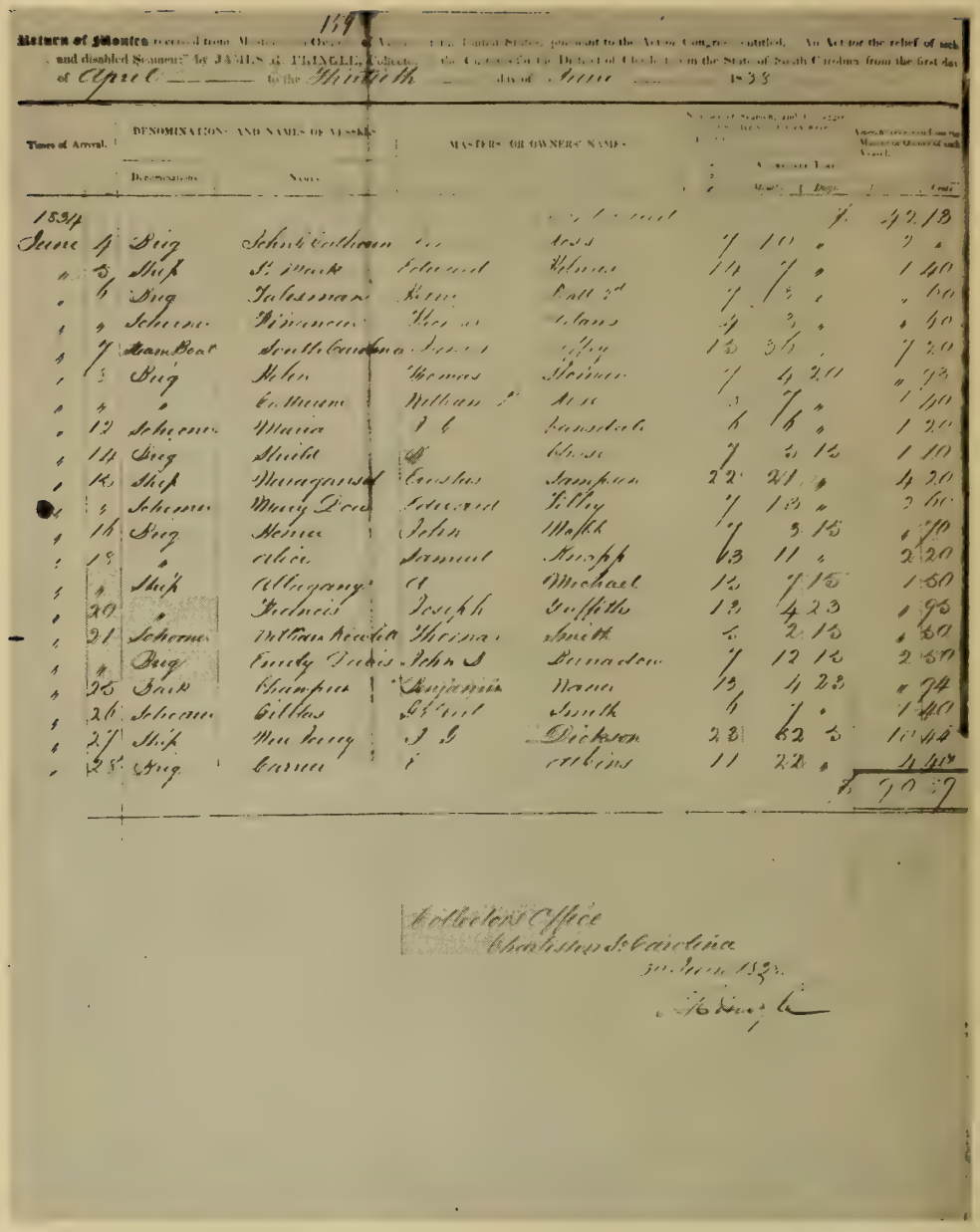
Surveyor and Inspector.

(From USPHS Records)

Return submitted to Collector of Customs, Louisville, Kentucky, 1840, of deductions from wages of seamen, for deposit to Marine Hospital Fund.

(From USPHS Records)

Staff, U. S. Marine Hospital, San Francisco, California, June 1, 1890. Dr. Robert D. Murray (seated, third from left), Medical Officer in Charge.



Return of Seamen received from Masters or Owners of Vessels in the United States, pursuant to the Act of Congress entitled, An Act for the relief of sick and disabled Seamen" by JAMES R. PRINGLE, Collector of the Customs for the District of Charleston in the State of South Carolina from the first day of April to the thirtieth day of June 1838

Times of Arrival.		DENOMINATION AND NAMES OF VESSELS		MASTERS OR OWNERS' NAMES					
		Denomination	Name			Tons	Months	Days	Amount of Duty Received
1838									$ 42 18
June	4	Brig	Schuylerthorn	[illegible]	[illegible]	7	10	0	2 0
"	5	Ship	S. Mark	Edward	Holmes	11	7	0	1 40
"	6	Brig	Salvorman	Rene	Ball 3d	7	5	0	0 60
"	9	Schooner	Dimmock	Thomas	Adams	4	3	0	0 40
"	7	Steam Boat	South Carolina	James	Petty	15	35	0	7 20
"	8	Brig	Helen	Thomas	Skinner	7	4	20	0 [illegible]
"	9	"	Catharine	William	Ross	5	7	0	1 40
"	12	Schooner	Maria	[illegible]	Ramsdale	6	6	0	1 20
"	14	Brig	Shiloh	[illegible]	Hoss	7	5	12	1 10
"	15	Ship	Marquis of	Carolus	Sampson	22	21	0	4 20
"	15	Schooner	Mary Ann	Edward	Kelly	7	13	0	2 60
"	16	Brig	Nestor	John	Wasth	7	3	15	0 70
"	18	"	Calico	Samuel	Knapp	13	11	0	2 20
"	19	Ship	Allegany	[illegible]	Michael	12	7	15	1 50
"	20	"	Francis	Joseph	Griffiths	13	4	23	0 95
"	21	Schooner	William Lowden	Thomas	Smith	5	2	15	0 50
"	22	Brig	Emily Dickie	John S	Bernadou	7	12	12	2 50
"	25	Bark	Champion	Benjamin	Mason	13	4	23	0 94
"	26	Schooner	Gilbert	Gilbert	Smith	6	7	0	1 40
"	27	Ship	Mediterranean	J. S.	Dickson	28	62	5	10 46
"	28	Brig	Carrier	[illegible]	Corbins	11	22	0	4 40
									$ 90 27

Collectors Office
Charleston S. Carolina
30 June 1838.
J. R. Pringle

(From USPHS Records)

Return by the Collector of Customs, Charleston, South Carolina, 1838, of deductions from wages of seamen for Marine Hospital Fund.

For 1950, there are 122 medical interns, 35 dental interns, and 147 medical residents participating in the various training programs.

Research in Service Hospitals

The third principal function of a hospital, along with the provision of medical care and the training of medical and allied personnel, is the carrying out of research. Important work in the field of drug addiction has been carried out since 1935 by the Research Unit at the U. S. Public Health Service Hospital at Lexington. Since 1938, there has been a Tumor Clinic at the U. S. Marine Hospital at Baltimore which has carried out tumor research as a joint project of the National Cancer Institute and the Division of Hospitals. The sulfone treatment of leprosy was begun and developed at the U. S. Marine Hospital, Carville, Louisiana, the National Leprosarium. In 1949, cardiovascular research units were developed at the Marine Hospitals at Staten Island and Baltimore in cooperation with, and with the support of, the National Heart Institute. Other hospitals have carried out research in various clinical fields; an example of the research carried out on the initiative of individual clinicians was the development of continuous caudal analgesia at the Staten Island Marine Hospital.

Progress in Medical Care of Service Beneficiaries Since 1798

The care of sick merchant seamen in the first Marine Hospital at Boston, when it was opened in 1800, was a simple procedure as compared with the administration of a present-day hospital of the Service. The staff of the hospital consisted of the physician, a hospital steward, cook, laundress, attendants, laborers, and nurses. The nurses were practical nurses, usually women.

In contrast to the many aids to diagnosis that are necessary for the successful practice of medicine in 1950, such as X-rays, clinical thermometers, hypodermic syringes, stethoscopes, instruments for measuring and recording blood pressure, basal metabolism, cystoscope, electrocardiograph, and the like, and also the various laboratory procedures, the physician of the early 1800's had only his bag of drugs, his lancet, and a few other simple instruments. He, of course, had his natural senses—

eyes, hearing, and the sense of touch. Whether a patient had fever could not be determined accurately because only the sense of touch was the means of measurement.

The fact that the physicians of that day did not have an armamentarium of drugs of selective action and diagnostic equipment such as are now available should not cause us to lose sight of the fact that many of these men developed unusual powers of observation and had, in many cases, excellent judgment and fine clinical sense. This was despite the fact that the cause of most of the diseases that they treated was not understood in the present-day concept.

Blood-letting and blistering were still favorite procedures in the early 1800's, as were purging, scarifying, and the clyster or enema. Empiricism characterized the time. It was, in fact, an age of crudity in medicine and surgery. Surgical operations of those days were for the most part emergency procedures necessitated by injury or infection. Broken bones were set, dislocations reduced, wounds probed and sutured, crushed or gangrenous limbs amputated, teeth extracted and abscesses lanced. Few dared to invade the great cavities of the body, the chest, the head, and the abdomen. A few surgeons undertook to crush and remove bladder stones, using the then newly invented lithotrite. Infection was the greatest handicap of the surgeon, since the bacterial cause of infection was unknown, as was antisepsis.

Laennec invented the stethoscope about 1819. Anesthesia with ether was introduced in the early 1840's. The clinical thermometer did not come into general use until shortly after 1866. The early thermometers were quite unwieldy, being some 10 inches long, and required about 20 minutes to register. There were no clinical laboratories. The examination of urine was accomplished by observing it in a glass container.

The medicaments then used by physicians were of a simple nature, that is, simple in the source of the ingredients which were mostly of plant origin and of wide variety. It was, indeed, a day when many drugs were administered simultaneously, the typical prescription or remedy containing numerous ingredients. The most used and best understood drugs and chemicals of the time included: aconite; aloe; alum; ammonium chloride; antimony salts, including tartar emetic; arsenious acid; asafoeti-

(Knabb-Lane Studio, Natchez, Mississippi)

This building was originally constructed by the Federal Government at Natchez, Mississippi, about 1840 for use as a Marine Hospital. During the Civil War it was used by the Confederate forces as a military hospital. After occupation of Natchez by the Federal forces the hospital was taken over by the military authorities and used by the Union troops. Immediately following the Civil War the State of Mississippi purchased the hospital property for use as a State Charity Hospital. The City of Natchez purchased the hospital in 1880. About 1890 the State of Mississippi began to appropriate funds for the support of this hospital and it again became a State Charity Hospital and has been used for that purpose since that date.

da; belladonna; bismuth subnitrate; camphor; castor oil; cinchona; colchicum; colocynth; copper sulphate; cream of tartar; digitalis; gamboge; gentian; Glauber's salt; hyoscyamus; ipecac; jalap; lead acetate; mandrake; mercury and its salts, including calomel and corrosive sublimate; opium including laudanum; rhubarb; rochelle salt; sassafras; scammony; senna; silver nitrate; snakeroot; spirit of ethyl nitrate; squill; sulphur; turpentine; valerian; veratrum.

Physicians in 1910 listed the 10 most important drugs then used in medicine in the following order:

1. Ether
2. Morphine
3. Digitalis
4. Diphtheria antitoxin
5. Smallpox vaccine
6. Iron
7. Quinine
8. Iodine
9. Alcohol
10. Mercury

In 1950, the list might read:

Anesthetics (ether, procaine and para-amino benzoate derivatives)
Antibiotics (such as penicillin and streptomycin)
Antihistaminics
Antiseptics and disinfectants (alcohol, iodine)
Digitalis and its derivatives
Hormonal substances
Immunizing agents (specific antitoxins, and vaccines as diphtheria, tetanus, smallpox)
Oxygen
Parenteral fluids (blood, plasma, and blood derivatives)
Radio therapy (radium, X-ray and radioactive substances)
Sedatives and analgesics (morphine and other opium derivatives, barbiturates)
Substitution products (insulin, thyroid extract, liver extract)
Vitamins

Supplementing this list are the wonders of modern surgery, aided by effective nursing, physical therapy, dietetics, and all the other means available to the present day physician. The entire structure of medical and surgical treatment of 1950 rests upon the progress made in bacteriology, chemistry, physiology, psychiatry, and pathology during the past one hundred and fifty years.

The changes in the physical plant and facilities of Service hospitals since 1800 have been enormous, but the changes in medical practice have been almost beyond description. Pasteur, Lister, Roentgen, and Fleming were still far in the future. By trial and error, but always thoughtfully and according to the teaching of the time, the pioneers in medicine groped toward the light in which present-day physicians still feel their way.

In the field of hospital and headquarters administration, there has been a steady advance in the plans of the Division of Hospitals to standardize equipment and supplies, to simplify procedures, reports, records, and general administrative practices, and to coordinate the work of the Division of Hospitals with the general aim of the Public Health Service.

The increasing knowledge of disease processes has provided ever-widening opportunities for physicians and surgeons to serve sick and injured people. The professional personnel of the Public Health Service have kept up with the march of progress in the past, and will continue to strive in the future toward the ideal of giving their patients medical services that will meet the highest standards of excellence.

CHAPTER II

On Guard Against Disease From Without

He is most free from danger, who, even when safe, is on his guard.
—PUBLIUS SYRUS

Origin of Quarantine

THE RELATIONSHIP of the spread of disease to travel has been recognized for many centuries. This has been of especial importance in maritime traffic, and more recently with respect to air traffic.

Whatever efforts may have been made in the earlier centuries to prevent the spread of communicable disease, it seems probable that the detention of ships and travelers and the regulation of traffic at seaports were first practiced by the city of Venice in the early part of the 14th Century many years before the development of the science of bacteriology and more specific knowledge of the cause and mode of transmission of the communicable diseases. As early as 1348 Venice had a system for the treatment of infected ships, travelers, and merchandise, and in 1403 a quarantine station was established. Other ports on the Mediterranean followed this example, notably Genoa in 1467, and Marseille in 1626. The system of quarantine gradually spread throughout Europe, and in some places was accompanied by drastic destruction, such as the burning of all goods belonging to infected persons.

During the Middle Ages various procedures were developed in an effort to prevent the spread of bubonic plague. An incident in this medieval attempt to control plague has left a mark on our language with the word quarantine. The Republic of Ragusa, on the eastern shore of the Adriatic, adopted and extended the regulations that had been successful at Venice. A landing station was established remote from the city and the harbor. There, incoming suspects were required to spend 30 days in the open air and sunlight, and any who had contact with them were also isolated. The period of 30 days was spoken of as the

THE MASSACHUSETTS BAY IN NEW ENGLAND. 237

1647-8.

Marc[h] Infectio.

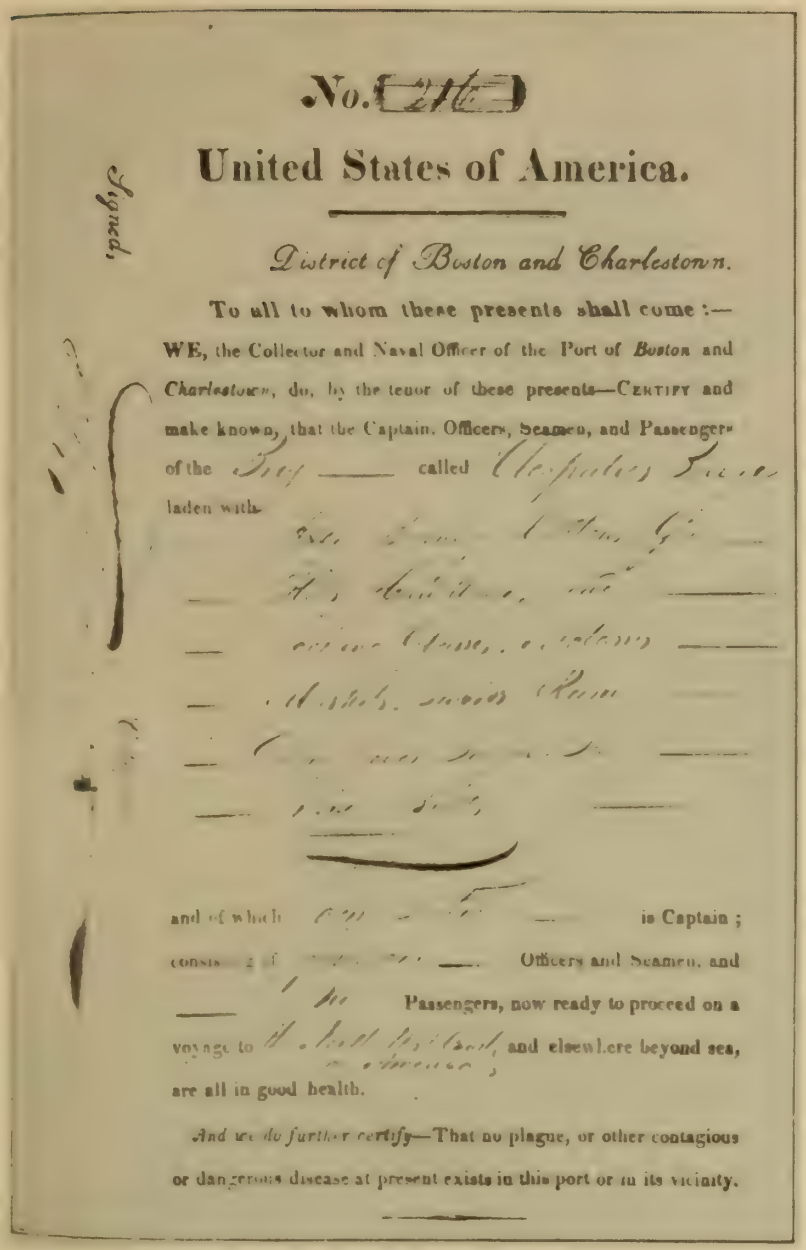
For asmuch as this Co[r]te is credibly informed y[t] y[e] plague, or like greivos [in]fectious disease, hath lately exceed[d]y raged in y[e] Barbadoes, Christophers, & oth[r] i[slands] in y[e] West Indies, to y[e] great depopulat[n] of those, it is therefore ord[r]ed, y[t] all [our own] or oth[r] vessels come[t] from any p̄ts of y[e] West Indies to Boston harbor *shall stop [and come to an] anchor before they come at y[e] Castle, und[r] y[e] pœnalty of 100[l], & that no p̄son comeing in any vessell from the West Indies shall go a shore in any towne, village, or farme, or come within foure rods of any oth[r] p̄son, but such as belongs to the vessels company y[t] hee or shee came in, or any wayes land or convey any goods brought in any such vessels to any towne, villag[e], or farme aforesaid, or any oth[r] place w[th]in this iurisdiction, except it be upon some iland where no inhabitant resides, w[th]out licence from y[e] councell, or some three of them, und[r] y[e] aforesaid pœnalty of a hundred pound for ev[r]y offence. [*200.]

That no inhabitant, seaman, or other p̄son whatsoev[r], reciding w[th]in this iurisdiction, shall go a board any such shipp or vessell comeing from the West Indies aforesaid, or buy or otherwise take into his possession any goods or marchandize brought in any such vessell, w[th]out licence as aforesaid, und[r] y[e] pœnalty of 100[l], & to be otherwise confined or restrained, as the said councell, or some three of them, shall appoint; & to y[e] end y[t] all p̄sons may have due information hereof, it is hereby agreed, y[t] this ord[r] shalbe forthw[th] published, & a coppy thereof sent to y[e] captaine of y[e] Castle, togeth[r] w[th] com̄ission to him to cause ev[r]y shipp or other vessell, belonging to y[e] country or any oth[r] place, y[t] shall come from any p̄t of the West Indies aforesaid, to stop & come to an anchor before they shall passe y[e] Castle, & then send unto them a coppy of this order, & there cause them to remaine till furth[r] order from y[e] councell, or some three of them, whose counsell is to be taken therein; this ord[r] to continue till this Co[r]te or the councell of y[e] com̄on wealth shall see cause to repeale y[e] same.

It is furth[r] ord[r]ed, y[t] a coppy of this order shall be forthw[th] sent to the sev[r]all cunstables of ev[r]y port towne in this iurisdiction, w[th] warrant to give notice thereof, w[th] all possible speed, to any vessell comeing from y[e] West Indies aforesaid, upon y[e] first veiw thereof, & furth[r] to see to y[e] execution of this ord[r], according to y[e] utmost of their ability, & y[t] y[e] councell, or some three of them, shall have pow[r] to appoint some convenient place, upon some of y[e] ilands or oth[r] fit places, where such p̄sons & goods shalbe sheltered for a time, & to do any thing of like nature y[t] shall be necessary for their preservation, & welfare of y[e] country.

(From *Records of the Company of Massachusetts Bay in New England, 1850*, vol. 2, p. 237)

Enactment by Massachusetts Bay Colony 1647, to prevent the introduction of disease by ships.



No. [illegible]

United States of America.

Signed,

District of Boston and Charlestown.

To all to whom these presents shall come:—

WE, the Collector and Naval Officer of the Port of *Boston* and *Charlestown*, do, by the tenor of these presents—CERTIFY and make known, that the Captain, Officers, Seamen, and Passengers of the [illegible] called [illegible] laden with

[illegible]

and of which [illegible] is Captain; consisting of [illegible] Officers and Seamen, and [illegible] Passengers, now ready to proceed on a voyage to [illegible] and elsewhere beyond sea, are all in good health.

And we do further certify—That no plague, or other contagious or dangerous disease at present exists in this port or in its vicinity.

(From *Maritime History of Massachusetts 1783-1860*, by S. E. Morison)

Bill of Health signed by Henry A. S. Dearborn, Collector of Customs, issued at Boston about 1820 for "Cleopatra's Barge." The cargo shown on the bill of health consisted of: Ales, Brandy, Cottons, Gin, Hats, Hardware, Lead, Looking Glasses, Molasses, Muskets, Swords, Rum, Dry Goods, Sugar, Tea, Wine, Boots.

"trentina." Later this period was found to be inadequate. The 30 days was increased to 40 days—the quarantina—hence we have the word "quarantine" meaning literally 40 days.

In 1710, England passed a rigorous quarantine Act and even as late as 1721 foreign ships from Cyprus, where plague was then prevalent, were burned in English waters by the sanitary authorities.

Sanitary bulletins were documents issued incident to quarantines and sanitary cordons. They were so called because they were stamped with the "bollo" or seal of the authority issuing them. Under the system of sanitary bulletins, passengers and crew, in their connection with ships, were designated as "clean," when beyond suspicion; "touched," when from a noninfected place in active communication with infected places; "suspicious," without sickness aboard, but having received goods from places or from ships or caravans from places where pests prevailed; and "foul or dirty," when from places where epidemic disease existed.

Floating hulks were used as quarantine stations in England from about the middle of the 18th Century. In 1710 during the reign of Queen Anne of England, there was an outbreak of plague in Poland which led Parliament to enact laws requiring vessels bound for England from the Baltic to undergo quarantine restrictions. A few years later all vessels on the way to England and liable to quarantine were required to show a yellow flag at the mainmast head when in sight of other vessels at sea during the day, and a distinctive light at night. Thus began the use of the yellow quarantine flag which later became the letter "Q" in the international maritime code of flag signals.

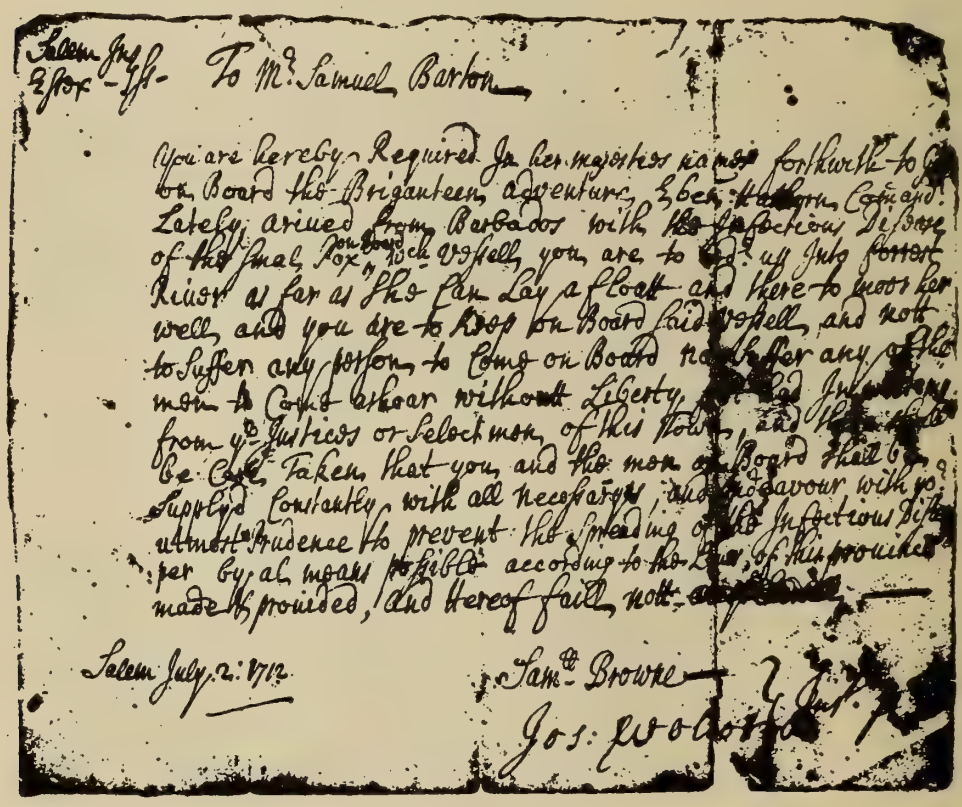
The earlier practice of quarantine in Europe seems to have been directed against leprosy, bubonic plague, and syphilis.

Quarantine in American Colonies

In Colonial America, the earliest quarantine restriction was enacted by the Massachusetts Bay Colony in 1647 against ships from Barbados. The Province of Pennsylvania, in 1700, enacted legislation—"An act to prevent sickly vessels coming into the government." In 1701, the legislative assembly of Massachusetts put into effect "An act providing, in case of sickness, That for the better preventing the spread of infection, and so forth." Smallpox and yellow fever were then the diseases of most

concern to that colony. The idea of quarantine in the colonies at first was directed toward disease which entered by sea. The concept of local quarantine and isolation was a later development.

There is ample evidence that yellow fever prevailed to some extent in New York City in 20 of the 100 years from 1723 to 1822. There was a disastrous outbreak of yellow fever in Philadelphia (then the capital of the United States) in 1793, and it is known to have been present in Boston in 1796. The city of Charleston in the Province of Carolina enacted a quarantine law on June 7, 1712, entitled "An act for the more effectual preventing of the spread of contagious distempers, and the appointment of a health officer." In authorizing the appointment of a health officer, it defined his power on board vessels, authorized him to send persons from vessels to the pest house, and gave authority to detain vessels when cases of disease were on board. Punishment by a fine for violation was provided.



Salem July 2d 1712 — To Mr. Samuel Barton

You are Hereby Required In her majesties name forthwith to Go on Board the Briganteen Adventure, Ebenezer Hathorn Comand. Lately arrived from Barbados with the Infectious Disease of the Small Pox on Board Sd Vessell, you are to Go: up July Northward as far as the Can Lay a Float and there to moor her well, and you are to Keep on Board said vessell, and not to Suffer any person to Come on Board nor suffer any of the men to Come ashoar without Liberty [illegible] July Mony from the Justices or Selectmen of this Town, and that you Be Carefull Taken that you and the men on Board shall be Supplyd Constantly with all necessarys, and endeavour with yo. utmost Prudence to prevent the Spreading of the Infectious Disease per by all meanes possible according to the Law of this province made & provided, and Hereof fail not at your [illegible]

Salem July 2: 1712

Sam. Browne Jun.

Jos: Woodbridge Jun.

Salem,
Essex, ss.

To Mr. Samuel Barton.

You are hereby Required in her Majesties name forthwith to go on board the Briganteen Adventure, Eben Hathern Command, Lately arrived from Barbados with the infectious diseases of the small pox, on board such vessell you are to go up into Forrest River as far as she can lay a floatt and there to moor her well and you are to keep on board said vessell and nott to suffer any person to come on board nor suffer any of the men to come ashore withoutt Liberty first had in writeing from ye Justices or Select men of this Town and there shall be care taken that you and the men on Board shall be supplyd constantly with all necessary's and indeavour with ye utmost prudence to prevent the spreading of the infectious disease pox, by al means possible according to thos Laws of this province made & provided, and hereof faill nott.

Salem July 2, 1712. Sam Brown,) Jus. P.
Jos. Woliot,)

An important development in the prevention of smallpox was the inoculation of individuals against the disease. This was before the development of vaccination by Edward Jenner in 1796. This form of preventive medicine (inoculation) was introduced in the American colonies about 1721. It resulted in much excitement and opposition. Although inoculation* against smallpox was a success from the first, those who voluntarily submitted to its use were considered a menace. Cotton Mather, an ardent advocate of the protective method of inoculation, permitted individuals to undergo inoculation in his house. Some people were apprehensive, however, and as late as 1774, a hospital in Salem, Massachusetts, was burned for fear that it would be turned into an inoculation hospital.

In 1754 the Colonial Government of New York instituted quarantine measures. A tax was imposed on all seamen and passengers entering the port of New York, and with the funds thus provided hospital buildings were established, first on Governor's Island and afterwards on Bedloe's Island. The fund thus created, besides providing quarantine accommo-

*Inoculation against smallpox was accomplished by a direct transfer of material from the sores of the eruption of a patient ill with smallpox to a scarified spot on the body of the person receiving the inoculation. Vaccination against smallpox is the introduction of the virus of cowpox, a mild disease, into scarified skin of a person.

dations, was used by the Legislature in establishing city dispensaries and assisting the Society for the Reformation of Juvenile Delinquents.

Beginning of Quarantine in United States

In 1794, Congress gave assent to the appointment of a health officer by the State of Maryland for the port of Baltimore. An Act approved June 9, 1794, provided:

> That the consent of Congress be and is hereby granted and declared, to the operation of an act of the General Assembly of Maryland, passed the 28th of December, 1793, entitled "An act to appoint a health officer for the port of Baltimore, in Baltimore County, so far as to enable the state aforesaid to collect a duty of one cent per ton on all vessels coming into the district of Baltimore from a foreign voyage for the purposes in the said act intended."

There was also the stipulation "That this act shall continue in force to the end of the next session of Congress and no longer."

The Act of April 3, 1794, allowed Congress to convene at such other place than the seat of government, as the President may judge proper in case of "prevalence of contagious sickness." This action was taken because of the outbreaks of yellow fever that occurred in New York City and Philadelphia during the summer season.

> An Act of Congress, approved May 27, 1796, authorized the President to direct the revenue officers and the officers commanding forts and the revenue cutters to aid in the execution of health laws of the States, respectively, in such manner as may to him appear necessary.

The Act of February 25, 1799, which repealed the Act of May 27, 1796, placed the supervision of maritime quarantine under the Secretary of the Treasury and directed that quarantine and other restraints established by the health laws of any State respecting any vessel shall be duly observed by the officers of the customs revenue, by the masters and crews of revenue cutters, and by military officers commanding any fort or station. This Act also provided for warehouses for receiving cargo from vessels subject to quarantine or other restraint pursuant to the health laws of any State.

There was also provision in the Act "that in case of the prevalence of a contagious or epidemical disease at the seat of Government, it shall

be lawful for the President to direct the removal of public offices to other places."

Smallpox Vaccination Introduced Into United States

Dr. Benjamin Waterhouse, who was in charge of the Marine Hospital Service at Boston, Massachusetts, from 1807 to 1809 was the first to introduce vaccination against smallpox into this country.

Early in 1799 Doctor Waterhouse received from Dr. John C. Lettsom, a physician friend in London, a copy of Dr. Edward Jenner's now famous "Inquiry into the Causes and Effects of the Variolae Vaccinae or Cow-Pox." Doctor Waterhouse was impressed with the remarkable advantages that might accrue to the United States from this discovery. Believing that Jenner's work would be of great interest to physicians and that knowledge of the results of Jenner's experimental proof would be of possible importance, Doctor Waterhouse published an abstract of it under the title "Something Curious in the Medical Line," in the Columbian Sentinel, a semi-weekly Boston newspaper.

In June, 1800, Doctor Waterhouse received some of the cowpox matter from another friend in England. To test its worth he vaccinated his five-year old son, Daniel Oliver Waterhouse, on July 8, 1800. When the sore on the child's arm followed the course as described by Jenner, he vaccinated a servant boy. Later, he vaccinated other members of his household. When these members of his family were subsequently exposed to smallpox, they proved to be immune. The five-year-old Daniel has the distinction of being the first person to be vaccinated in America.

On December 1, 1800, failing to get full cooperation from the physicians of Boston, Doctor Waterhouse wrote to Thomas Jefferson, then Vice-President and candidate for the Presidency, enclosing an account of the use of cowpox as a preventive of smallpox. Mr. Jefferson replied on December 25, 1800. Thus began an historic correspondence which lasted a year and in the course of which time Doctor Waterhouse sent to Mr. Jefferson numerous lots of cowpox matter with instructions for its use, until the cowpox had become established in Virginia and further importations were unnecessary. Thus, Mr. Jefferson gave material assistance in introducing smallpox vaccination in America. Many cities

and towns obtained their first viable virus direct from Doctor Waterhouse; many others obtained it from the strains he sent to President Thomas Jefferson.

Through the efforts of Mr. Jefferson, the following "Act to encourage vaccination" was passed by the Congress and approved on February 27, 1813:

That the President of the United States be, and he is hereby authorized to appoint an agent to preserve the genuine vaccine matter, and to furnish same to any citizen of the United States whenever it may be applied for, through the medium of the post office; and such agent shall, previous to his entering upon the execution of the duties assigned to him by this act, and before he shall be entitled to the privilege of franking any letter or package as herein allowed, take and subscribe the following oath or affirmation before some magistrate and cause a certificate thereof to be filed in the general post office: "I, A. B., do swear (or affirm, as the case may be) that I will faithfully use my best exertions to preserve the genuine vaccine matter, and to furnish the same to the citizens of the United States, and also that I will abstain from everything prohibited in relation to the establishment of the post office of the United States." And it shall be the duty of the said agent to transmit to the several postmasters in the United States a copy of this act, and he shall also forward to them a public notice directing how and where all application shall be made to him for vaccine matter.

Sec. 2. That all letters or packages not exceeding half an ounce in weight, containing vaccine matter or relating to the subject of vaccination, and that alone, shall be carried by the United States mail free of any postage, either to or from the agent who may be appointed to carry the provisions of this act into effect: *Provided always,* That the said agent before he delivers any letter for transmission by the mail shall in his own proper handwriting, on the outside thereof, indorse the word "Vaccination" and thereto subscribe his name, and shall previously furnish the postmaster of the office where he shall deposit the same with a specimen of his signature; and if said agent shall frank any letter or package in which shall be contained anything relative to any subject other than vaccination, he shall, on conviction of every such offense, forfeit and pay a fine of $50, to be recovered in the same manner as other fines or violations of law establishing the post office: *Provided also,* That the discharge of any agent and the reappointment of another in his stead be at the discretion of the President of the United States.

Vaccination against smallpox having become well established in the United States, further assistance from the Government appeared to be unnecessary; the "Act to encourage vaccination" was repealed, effective May 4, 1822.

Cholera

There were sharp outbreaks of cholera in the United States during 1832, 1833, and 1834. The traffic on the Mississippi River was an important factor in the spread of this disease into the interior of the country. The Secretary of the Treasury, by an Act of Congress, approved July 13, 1832, was temporarily given authority to use revenue cutters to enforce the quarantine laws made by the States.

Another outbreak of cholera in the United States occurred during 1866. In connection with the control of this outbreak, the following joint resolution was enacted by the Congress:

> That the Secretary of the Treasury be, and he hereby is, authorized to make and carry into effect such orders and regulations of quarantine as, in his opinion, may be deemed necessary and proper, in aid of State or municipal authorities, to guard against the introduction of the cholera into the ports of the United States; and the Secretary of the Treasury is authorized to direct the revenue officers and the officers commanding revenue cutters to aid in the execution of such quarantine, and also in the execution of the health laws of the States respectively in such manner as may to him seem necessary. And such an amount of money as may be necessary to carry into effect this joint resolution is hereby appropriated out of any money in the Treasury not otherwise appropriated; provided the authority hereby granted shall expire on the first Monday in January Anno Domini 1867. Approved May 26, 1866.

Public interest in sanitary problems was stirred by national sanitary conventions held in Philadelphia in 1857, Baltimore in 1858, New York in 1859, and Baltimore in 1860. These conventions ceased with the outbreak of the war between the States.

New Science of Bacteriology

The continuing development of the science of bacteriology afforded the essential foundation upon which has been erected the present structure of public health endeavor as concerns communicable disease control. The first papers published by Pasteur, a French chemist, in August and December 1857, on lactic acid fermentation and alcoholic fermentation, showed that such chemical changes were caused by the action of living organisms. These advances revolutionized all former conceptions of disease and demanded the formulation of new theories. Lister, an English

surgeon, in 1867, began to put into practice the ideas of asepsis and antisepsis that he had gained as a student of Pasteur. He also demonstrated the effectiveness of sterilization and asepsis in the field of surgery. Koch announced in 1876 that he had worked out the life history of the anthrax bacillus. In 1879, G. Armauer Hansen, a Norwegian physician, announced his discovery of the organism causing leprosy. The bacillus of malignant edema was described by Pasteur in 1877. He also described the organism of chicken cholera in 1879. In the same year Neisser discovered the gonococcus. In 1880 the pneumococcus was discovered by Pasteur and Sternberg independently. The typhoid organism was described in the same year by Eberth. Koch, in 1882, discovered the organism of tuberculosis. The organism of Asiatic cholera was described by Koch in 1883, and the diphtheria organism by Klebs in 1884. Thus was laid the foundation for important advances in public health based upon accurate scientific knowledge. With the development of bacteriology came the problem of ascertaining the means of spread of these organisms and other factors connected with the dissemination of these diseases. Although it was known that the *Salmonella typhosa* was the cause of typhoid fever, further studies were necessary to show the relationship of milk, other foods, of insects, such as flies, and of human carriers in the distribution of the causative organism.

Effective public health work rests on the foundation of modern science. Of especial importance are bacteriology, parasitology, chemistry, and zoology. Without advances in the several fields of science, public health practice as we know it today would have been impossible of attainment.

Prevention of Introduction of Disease from Without

From the very first, Surgeon General John M. Woodworth envisaged not only a system of Marine Hospitals for the care of merchant seamen, but also a national health service to serve the entire nation. Because of the prevalence of major epidemic diseases, notably yellow fever, smallpox, and occasional outbreaks of cholera, Doctor Woodworth naturally turned to the problem of preventing the entrance of such diseases into the United States, as well as the control of epidemics within the country. The Quarantine Act of 1799 had become a dead letter. It was revived

by Doctor Woodworth in 1875 when he issued a circular letter to medical officers of the Marine Hospital Service defining their duties with reference to quarantine and public health and directing that they inform themselves fully as to the local health laws and regulations in force at their respective ports. They were directed also to obey these laws and to render prompt assistance in their enforcement when requested by the proper authorities. This was the first centralized action on the part of the Federal Government relating to quarantine for over seventy-five years after the Act of 1799. The importation of yellow fever and smallpox from foreign countries was an important stimulus in the development of a system of maritime quarantine for the United States.

At the International Medical Congress held in the United States in 1876, Surgeon General Woodworth presented a paper dealing with the need for a national quarantine system. Among the conclusions advanced by Doctor Woodworth were: The necessity for supervising ocean travel to secure good sanitary conditions; the importance of a system of port sanitation; the necessity for the inspection and detention, when required, of passengers and crews of ships from infected ports; the necessity of prompt and authoritative information relative to prevalence of diseases such as cholera and yellow fever in foreign ports; and the necessity for international cooperation in the control of disease.

Doctor Woodworth began formulating plans for a national system of maritime quarantine. He felt that efforts should be directed toward securing a more uniform system of inspection of arriving vessels, the medical examination of passengers and crews, and a shortened period of quarantine detention. He considered the detention of a vessel from an infected port, whether sickness existed aboard or not, as unjustifiable beyond the known period of incubation of the disease for which quarantine was to be enforced.

American Public Health Association Organized

In 1872 officers of the Marine Hospital Service participated in the organization of the American Public Health Association, the first national body of public health workers in the United States. Dr. Heber Smith represented the Marine Hospital Service at the organization meet-

ing held in New York on April 18, 1872. Surgeon General Woodworth was active in planning and developing the formation of the Association.

As the American Public Health Association has developed and expanded through the years, the interest and active cooperation of each successive Surgeon General has continued. During the early years of the American Public Health Association, it was largely an organization of administrative health officers who were concerned with the public health in cities, States, and the responsibilities of the Federal Government in this field. With the expansion of scientific knowledge, it became necessary to broaden the basis for membership so as to include sanitary engineers, chemists, bacteriologists, nurses, dentists, and others engaged in scientific specialties in the field of public health.

Public Health Work Begins to Evolve

The health conditions of the times and the continued failure to exercise the authority in quarantine matters possessed by the Treasury Department since 1799 stimulated Doctor Woodworth to press for action in developing an effective quarantine system to be supervised at the national level.

It was largely through the efforts of Doctor Woodworth that the national quarantine Act of April 29, 1878, was drafted and enacted into law. This was "An Act to prevent the introduction of contagious or infectious diseases into the United States."

Doctor Woodworth organized a yellow fever commission in 1878 which was sent south to gather information in regard to the epidemics which had devastated the southern States almost every year. The work of this commission was reported by representatives of the Service to the American Public Health Association in 1879. The work of Doctor Woodworth in the field of sanitation at that early date laid the foundation for the future development of the public health functions of the Service. By his capacity for organization, the Service was completely transformed from a chain of locally controlled hospitals to a national coordinated Service for rendering medical care to merchant seamen and for administering the national quarantine Act.

The loosely connected aggregation of local appointee physicians which, previous to 1871, constituted the Marine Hospital Service was, by elimination and welding, and by the addition of selected recruits ob-

DUTIES OF UNITED STATES OFFICERS WITH REFERENCE TO QUARANTINE AND THE PUBLIC HEALTH.

1874.
Department No. 90.
Secretary's Office.

Treasury Department,

September 8, 1874.

In the absence of uniformity in the regulations of quarantine upon the Atlantic and Gulf Coasts, it is desirable that the several officers specifically placed under the direction of the Treasury Department by the subjoined Section of The Revised Statutes of the United States inform themselves fully as to the local health-laws and the regulations based thereon and in force at their respective ports and stations, and strict compliance with such laws and prompt assistance in the enforcement of the same, when directed by competent authority, are hereby enjoined in accordance with the provisions of the following:

"SECTION 4792. The quarantines and other restraints established by the health-laws of any State, respecting any vessels arriving in, or bound to, any port or district thereof, shall be duly observed by
The officers of the customs revenue of the United States, by
The masters and crews of the several revenue-cutters, and by
The military officers commanding in any fort or station upon the sea-coast; and all such officers of the United States shall faithfully aid in the execution of such quarantines and health-laws, according to their respective powers, and within their respective precincts, and as they shall be directed, from time to time, by the Secretary of the Treasury." * * * * [*The Revised Statutes of the United States*, p. 890.]

Officers of the Customs Revenue are referred, in this connection, to Articles 294–295, *General Regulations under the Customs and Navigation Laws of the United States*, 1874, and are requested to bring the same to the notice of the proper local health authorities, attracting attention especially to the second and third paragraphs of Article 294.

Officers in command of vessels of the Revenue Marine are instructed that Article 904 of said *Regulations* is held to include communication with infected vessels as well as ports; and, in order to render more efficient assistance to local authorities in the enforcement of quarantine laws as therein directed, will take the necessary steps to advise such authorities of these instructions.

The cooperation of the military forces will be applied for only after exhausting the other powers and authorities herein mentioned; such application to be made to this Department, with a full statement of the facts for the information of the Honorable the Secretary of War.

Medical officers of the U. S. Marine-Hospital Service will govern their official action in consonance with this circular and the law as above cited; and will at all times assist as freely as practicable, not only other officers of the Government, but the quarantine authorities in the protection of the public health against the introduction of contagious diseases. In furtherance of this end they are instructed to communicate to the Supervising Surgeon, from time to time, such information and suggestions as will enable that officer to frame needful regulations and to take intelligent action in cases of emergency.

B. H. Bristow

Secretary of the Treasury.

tained after rigid examination, converted into a homogeneous mobile medical corps whose members were available for service in any part of the country whenever directed.

During the summer of 1877, a severe epidemic of yellow fever occurred in the Mississippi Valley, and in April of the following year, Con-

gress passed the first national quarantine Act. On the basis of this legislation which he had advocated so diligently, Doctor Woodworth planned to develop a national quarantine service. Unfortunately, early in 1879, death intervened and brought to an end his vigorous administration. He was succeeded in office by Dr. John B. Hamilton, who likewise concerned himself with the details which he hoped would effectuate the quarantine Act.

National Board of Health

These events were followed within a short time by the Act of March 3, 1879, which established a National Board of Health, to report directly to the President. Despite the motives which led to the creation of the Board, an overlapping of functions between it and the Marine Hospital Service was immediately apparent. Shortly after its establishment the National Board of Health undertook aggressive action to prevent the introduction of yellow fever and other epidemic diseases into the country by the establishment of quarantine stations at various ports. With the turn of affairs Doctor Hamilton found himself effectively blocked for a time in his solution of the problem of developing the much needed national quarantine plan.

The Act establishing the National Board of Health may be summarized as follows:

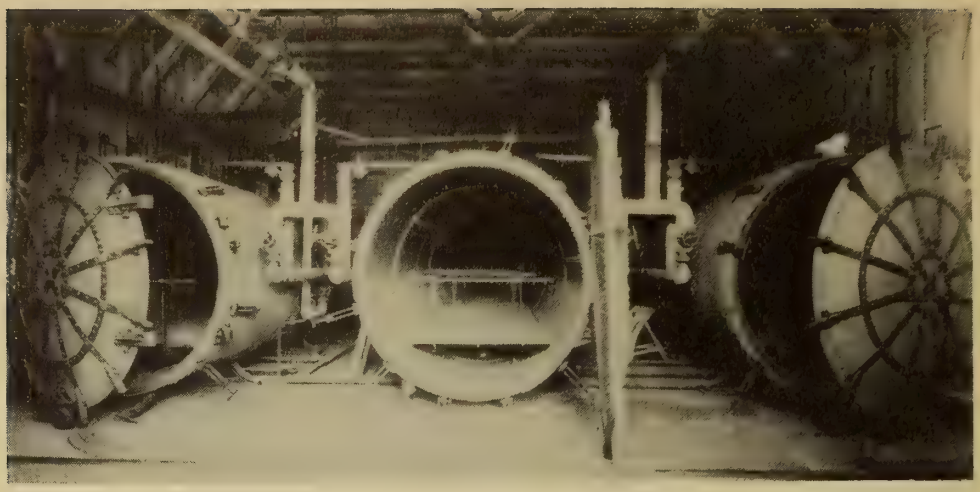
(1) No vessel shall enter any port of the United States from any foreign port where any contagious disease exists except as provided by law or regulation; (2) certificates of health must be secured from consular or medical officers at the port of departure and from the health officer at the port of entry; (3) medical officers may be detailed to foreign ports to serve in the offices of consuls, and officers from the several departments of the Government may be detailed for temporary duty to carry out the provisions of the act; (4) the national board of health shall cooperate with State and municipal boards of health to prevent the introduction and spread of disease, and regulations may be made when necessary; (5) the national board of health shall make and publish regulations governing conduct of vessels; (6) the national board of health shall secure and publish weekly reports of the sanitary condition of foreign ports and ports and places in the United States, and it shall secure other information relating to public health; (7) an annual report of the board's operation is required; (8) the Secretary of the Treasury is authorized to fix the fees for placing vessels in sanitary condition; (9) an appropriation is made and reports

(From USPHS Records)

Opening baggage for disinfection, U. S. Quarantine Station, Angel Island, San Francisco, California, 1896.

(From USPHS Records)

Pier and Disinfecting Shed, U. S. Quarantine Station, Dry Tortugas, Florida, 1895.



(From USPHS Records)

Disinfecting equipment for baggage and clothing, U. S. Quarantine Station, Angel Island, California, 1895.

(From USPHS Records)

Medical officer (Dr. Joseph A. Bell) and crew preparing to fumigate a ship, San Francisco, California (1931). White mice are used to detect cyanide gas.

of expenditures required; (10) certain parts of a previous act are repealed and also other inconsistent acts or parts of acts; (11) by its terms this act shall not continue in force for a longer period than four years from the date of its approval. (Act June 2, 1879)

Following the Act creating the National Board of Health and the appointment by the President of members of the Board, a meeting was held on April 2, 1879, for the purpose of organizing the Board. The Board was organized as follows:

Preston H. Bailhache, M.D., U. S. Marine Hospital Service, 240 Maryland Avenue, Baltimore, Maryland
Samuel M. Bemiss, M.D., 558 St. Charles Street, New Orleans, Louisiana
John S. Billings, M.D., Surgeon, U. S. Army, 84 Gay Street, Georgetown, D. C.
Henry I. Bowditch, M.D., 113 Boylston Street, Boston, Massachusetts
James L. Cabell, M.D., University of Virginia, Charlottesville, Virginia
Homer A. Johnson, M.D., 4 Sixteenth Street, Chicago, Illinois
Robert W. Mitchell, M.D., 34 Madison Street, Memphis, Tennessee
Samuel F. Phillips, Esq., Solicitor-General, 1119 K Street, Washington, D. C.
Stephen Smith, M.D., 57 West Forty-Second Street, New York
Thomas J. Turner, M.D., Medical Director, U. S. Navy, 1227 M Street, Washington, D. C.
Tullio S. Verdi, M.D., 815 Fourteenth Street, N.W., Washington, D. C.

OFFICERS

Dr. James L. Cabell ..... President
Dr. John S. Billings ..... Vice-President
Dr. Thomas J. Turner ..... Secretary

THE EXECUTIVE COMMITTEE

Dr. James L. Cabell
Dr. John S. Billings — Dr. Stephen Smith
Dr. Thomas J. Turner — Dr. Preston H. Bailhache

A circular announcing the establishment of the National Board of Health set forth rules for the government of the Board in aiding State and local boards of health. Among these were included specifications for applications for aid through the State board of health or, in case there was no State board of health, through the Governor of the State.

The Board met at varying intervals of approximately one month to six weeks. Meetings were held at several different places, including

Atlanta, Georgia, and Nashville, Tennessee; however, most of the meetings were held in Washington.

The executive committee met almost daily in Washington. Maritime and inland quarantine matters were the Board's principal concern, the establishment of quarantine stations being one of the first matters to be considered. Because of the occurrence each year of epidemics of yellow fever, it was natural that the Board should give special attention to epidemic outbreaks. A commission was appointed to investigate yellow fever in Cuba, and a printed report was later submitted.

The Act contained authority for the assignment of medical officers to foreign countries; however, only one officer was assigned by the Board to this duty, he being sent to Cuba. The Act also authorized the Board to collect information relative to sanitary conditions and to conduct related investigations. Under this plan the eastern and southern part of the United States was divided into districts or areas. The Board appointed eight inspectors who were assigned territory extending from Portland, Maine, to the mouth of the Rio Grande River in Texas. The Board also arranged for several well-known scientists to undertake an investigation of disinfectants.

Steps were taken by the Board to obtain uniformity in the methods of reporting of vital statistics. Attempts to collect information regarding outbreaks of disease are indicated in the records of the Board; for example, there was a report on malignant diphtheria in northern Vermont. At that time diphtheria bacillus had not been described, and there was no concept of modern methods of epidemiology.

Competition between the Marine Hospital Service and the National Board of Health is reflected in an Act approved August 7, 1882, providing appropriations for the National Board of Health, and restricting its activities so that: "hereafter the duties and investigations of the Board of Health shall be confined to the diseases of cholera, smallpox, and yellow fever."

The National Board of Health, during the four years of its existence, confined its activities largely to quarantine work and assistance to State and local authorities in the suppression of epidemics, principally yellow fever. The law under which the National Board of Health operated expired by limitation on March 2, 1883. The Marine Hospital Service

then took charge of national quarantine and public health matters and brought into active operation the quarantine law of 1878. The quarantine Act of February 15, 1893, specifically repealed the Act establishing the National Board of Health.

Quarantine Activities Resumed

The publication of weekly abstracts of consular sanitary reports and other related information was begun as the "Bulletin of Public Health" on July 13, 1878, as required by the quarantine Act of that year. Publication of these Bulletins was discontinued on May 12, 1879, but was resumed in January 1886, under the title of the *Weekly Abstract of Sanitary Reports.* This publication had been temporarily suspended during the period of activity of the National Board of Health.

The quarantine stations that were established by the National Board of Health were mainly refuge stations. The Marine Hospital Service took charge of them in 1883. Upon this foundation was developed the maritime quarantine system of the Marine Hospital Service. Quarantine stations for the detention and treatment of infected ships were established in 1883 at Ship Island, Mississippi (Gulf Quarantine), and Sapelo Sound, Blackbeard Island, Georgia (South Atlantic Quarantine). In 1888 quarantine stations were established at San Diego and San Francisco, California, and at Port Townsend, Washington. Cape Charles quarantine in Virginia was established in 1889; Delaware Breakwater quarantine, in 1892; Reedy Island quarantine, Delaware, in 1893; and Columbia River quarantine, Oregon, in 1899. Quarantine stations were taken over from the respective States under the following Acts of Congress:

Portland, Maine	March 3, 1903
Perth Amboy, New Jersey	March 3, 1905
Mobile, Alabama	June 19, 1906
New Orleans, Louisiana	June 19, 1906
Galveston, Texas	June 19, 1906
Boston, Massachusetts	July 1, 1916
Baltimore, Maryland	June 5, 1920
Marcus Hook, Pennsylvania (Philadelphia)	Leased 1919; Sec. 8, Act Feb. 15, 1893

The last quarantine station taken over from a State was that at the port of New York which was acquired by the Federal Government on March 1, 1921, under Act of Congress approved June 5, 1920.

Quarantine Directed Against Major Diseases

The quarantine system of the United States in its beginning was directed largely against yellow fever, smallpox, and cholera. Ships entering a port of the United States from a foreign country were required to anchor at a specified place. The Medical Officer in Charge of the quarantine station or his designated medical assistant, would board the vessel and, by examination of the vessel's documents, ascertain the ports last visited. The passengers and crew were then carefully examined for evidence of quarantinable diseases.

If the ship came from a port known to be infected with yellow fever, it was held to complete the incubation period of that disease. If the members of the crew or passengers on board showed evidence of illness from yellow fever or smallpox, they were taken to detention quarters where they were kept during the incubation period of the disease suspected. Depending upon the cargo, the ship might be fumigated and permitted to proceed to its destination, or it might be detained for the full incubation period. After inspection by the quarantine officer, if found to be free of disease, the ship was given pratique (permission to enter the port), or provisional pratique (permission to enter port, with certain restrictions, such as fumigation, upon discharge of cargo).

The early quarantine stations were located in the south principally for the purpose of protecting the southern States against the importation of yellow fever from the Caribbean area and from South America. Thus began an era during which were evolved methods and procedures that were intended to prevent yellow fever from entering this country. It was generally recognized that yellow fever was a communicable disease but its exact mode of spread had not as yet been determined.

The quarantine stations in the United States usually were located in remote areas, oftentimes on islands such as Blackbeard's Island off the southeast coast of Georgia, and Ship Island off the coast of Mississippi. The New Orleans quarantine station was located 90 miles down

the river at the entrance to the Gulf. Cities did not want vessels carrying persons ill with yellow fever and other major pestilential diseases to come into their ports, hence it was in response to popular demand that the early quarantine stations were located at some distance from the ports that they were designed to protect. The quarantine stations usually consisted of one or more boarding vessels to transport quarantine personnel to and from incoming vessels at anchor, and necessary structures for administration, detention of persons, and storage of fumigants and other materials. Quarters for medical officers and other essential personnel employed at the station were also provided.

In 1881, an ambulance steamer was constructed for use by the Service at the port of New York. This ambulance steamer was named *Woodworth,* in honor of Dr. John M. Woodworth, the first Surgeon General of the Service. This was the beginning of the custom of naming vessels at quarantine stations for deceased Service officers, particularly those officers who were specially distinguished or those who lost their lives in line of duty.

Empirical Procedures

In those early days of quarantine, before there was much exact knowledge about the methods by which communicable diseases were spread, many seemingly senseless things were done to control such diseases. Modern students, in the full bloom of their newer knowledge, have been prone to ridicule some of the practices of former days. Sometimes, however, there was merit in some of these practices, even if the merit were accidental or empirical, and resulted from trial and error with little or no real conception as to the reason for its success. For instance, one frequently quoted example is the former practice at maritime quarantine stations, when vessels were in detention because of the presence of cases of yellow fever, of dipping the ballast rocks of the vessel in a solution of bichloride of mercury. This practice was discontinued many years ago because it seemed to be absurd. But as with certain other practices of the times, it may have had a good deal more merit as a preventative measure than its critics realized.

Coincident with the arrival of a ship and the unloading of its ballast, cases of yellow fever might appear in a city. Not having knowledge of

the means by which yellow fever was spread, suspicion easily turned toward ballast from vessels known to have recently had cases of yellow fever on board, especially when the ballast was unloaded and left in the port.

The first Federal Quarantine Act (1878) lists among the items mentioned for quarantine inspection "Passenger, crew, cargo, and ballast." There are numerous references to ballast in the early days of quarantine. With the new knowledge of disinfectants, then recently demonstrated by Dr. Joseph Lister of England, which was just beginning to be disseminated, and with the mode of spread of yellow fever not known, it was natural, therefore, that in attempting to devise means to destroy an unknown infection on shipboard, a solution of bichloride of mercury should have been used on any objects that were suspected of transmitting the infection. Several of the southern States had specific requirements as to the use of solutions of bichloride of mercury for disinfecting ballast. We now know that yellow fever is transmitted by the *Aedes aegypti* mosquito, and that this type of mosquito breeds in open water casks on deck and in other parts of the vessel. Bilge water may at times also be a breeding site for mosquito larvae. Bichloride of mercury is a good larvicide and the elimination of the bilge water in the hold of the vessel and the dipping of the ballast from the hold in bichloride of mercury may therefore not actually have been as useless as was sometimes thought.

Those lonely quarantine stations were literally outposts of danger. A number of medical officers contracted yellow fever while on duty at these stations and several of them died.

Cooperation With States

Early in his administration Doctor Woodworth established cordial relations with State and local health authorities, particularly in the southern States during epidemics of yellow fever. The fact that he had been the Chief Medical Officer under General William Tecumseh Sherman in his famous ("infamous" to the South) "march to the sea" did not seem to have impaired his relations with the Southern people, although the feeling against General Sherman was still quite bitter.

Assistance was given local authorities in controlling epidemics of yellow fever in Florida and Texas in 1882. Through the efforts of the Serv-

ice in subsequent epidemics, the development of the detention camp method assisted in preventing the spread of disease without resorting to "shotgun" quarantine. The first detention camp was established in 1888 on the south bank of St. Mary's River (the boundary between Georgia and Florida). The camp was called Camp Perry in honor of Governor E. A. Perry of Florida. Refuge camps near infected cities were not new, but an inland quarantine, where suspects were detained only long enough to demonstrate that they were not infected and then permitted to proceed north, was a novel procedure at that time.

In 1888, additional legislation was secured providing penalties for the violation of quarantine laws and regulations, and in 1893, there was enacted the organic quarantine law. Previously, in 1890, the Congress had enacted a quarantine law relating to the prevention of the interstate spread of certain infectious diseases, cholera, yellow fever, smallpox, and bubonic plague, and providing that rules and regulations be promulgated by the Surgeon General.

Cholera Threatens from Europe

Persons sick with cholera appeared in American seaports in 1892, thus emphasizing the necessity for strengthening the quarantine protection of this country. These persons were detained at quarantine stations as they were detected. The Chicago Exposition of 1892 gave every indication of attracting a large number of visitors from Europe, and the possibility that the Exposition might become a failure because of the epidemic of cholera then in progress in Europe was probably an important factor in expediting the passage of the quarantine Act of 1893. The quarantine Act of 1878 was inadequate in that there was lack of Federal authority to enforce uniform regulations in regard to inspection and disinfection of ships and baggage. The Act of 1893 specifically gave the Federal Government the predominant right of quarantine inspection at the several ports. However, the States could still conduct quarantine inspections if they desired, and such inspections by some of the States were maintained for several years thereafter. Another factor in assisting in the control of the outbreak of cholera at that time was the fact that under the immigration Act, President Benjamin Harrison, at the

suggestion of Surgeon General Wyman, issued an order requiring detention for a period of 20 days of immigrant vessels from cholera-infected ports. As might be surmised the unusual expense attendant upon detaining immigrant vessels for 20 days had the immediate effect of practically suspending immigration, and as a result the menace of a cholera epidemic was removed.

Federal Quarantine Law Strengthened

The Act of February 15, 1893, established a legal basis for the quarantine authority of the Service. Among other things the Act provided for the assignment of medical officers of the Service to duty in foreign countries in order to obtain information regarding the prevalence of disease in those countries and to see that sanitary precautions were taken by vessels sailing from foreign ports to the United States. Detention of vessels entering any port of the United States with quarantinable diseases on board was also authorized.

The Act of 1893, also provided that no vessel from a foreign port should enter a port of the United States except in conformity with the provisions of the Act and in accordance with quarantine rules and regulations. Vessels were required by this Act to obtain a bill of health from the American Consul at the port of departure. Also authorized was the acquisition of State quarantine property, which further coordinated and stabilized the quarantine system.

Following the passage of the quarantine Act of 1893, officers of the Marine Hospital Service were assigned to the following ports in Europe to aid in preventing the introduction of cholera:

Southampton—Dr. William J. Pettus
Liverpool—Dr. Louis L. Williams, Sr.
Hamburg—Dr. Joseph H. White
Bremen—Dr. Paul M. Carrington
Rotterdam—Dr. Rell M. Woodward
Glasgow—Dr. William G. Stimpson
Antwerp—Dr. Milton J. Rosenau
Le Havre—Dr. E. R. Houghton
Marseille—Dr. Fairfax Irwin
Genoa—Dr. Benjamin W. Brown
Naples—Dr. Geo. B. Young

The officer of the Marine Hospital Service who reported the incident related below evidently felt that the restrictions placed on outgoing vessels and passengers by the Marine Hospital Service, particularly with reference to food and water, demonstrated the value of sanitary precautions in preventing the occurrence of cholera during the voyage. This officer's report stated:

Eight ships left Naples, Italy, between July 15 and August 17, 1893. These eight ships cleared from Naples with steerage passengers, four destined for New York, the *Karamania, Weser, Cashmire* and *Massilia,* and four for South American ports. Cholera had not been recognized previously in Naples; however, the occurrence of cholera in Naples was confirmed bacteriologically three days after the sailing of the first ship for South America and before any of the four ships sailed for the United States. The ships and passengers destined for the United States were made to undergo a rigorous routine in preparation for the journey. Each ship was required to be physically clean, water and food supplies were carefully checked, the passengers vaccinated, and baggage and clothing searched for food. Three cases of cholera occurred on one of these ships before it reached New York. The passengers upon reaching New York were placed in isolation and the ship was detained at quarantine for the incubation period of five days. The other three ships, upon arriving in the United States port, were also required to be detained for five days.

The four vessels destined for South America, the *Vencenzio Florio, Andrea Dorio, El Remo,* and *Carlo R.,* became veritable floating pesthouses. The *Vencenzio Florio* had about 50 deaths from cholera en route; the *Andrea Dorio,* 90 deaths en route; the *El Remo,* 84 deaths, and the *Carlo R.* had 230 deaths. There was no inspection of food, passengers, or sanitary conditions on those ships before departing for their South American destination.

In 1899-1900, bubonic plague was present in several European ports, especially at Marseille, Genoa, and Naples. To provide protection of the United States from the introduction of this disease, officers of the Service were stationed from November 1899, until June 1900, at 14 ports in Europe, including Italy, Spain, Holland, Germany, France, and the British Isles.

Spanish-American War

With the termination of hostilities with Spain and the return of the troops from Cuba, where it was definitely known that yellow fever had prevailed among them to a considerable extent, the possibility of introducing yellow fever into the United States was viewed with marked

apprehension by State and local health officers, as well as by the Marine Hospital Service. Therefore, steps were taken by the Marine Hospital Service to insure adequate quarantine inspection of troops being returned from Cuba and Puerto Rico. More than 30,000 troops were inspected at quarantine stations by officers of the Marine Hospital Service. A large proportion of these troops were detained in quarantine for a period of five days to determine whether cases of yellow fever would develop. At one quarantine station (Savannah) as many as 10,000 troops were held at one time in a quarantine detention camp.

The baggage of the returning troops also was disinfected at the quarantine stations. In March and April of 1899, approximately 18,000 tons of baggage, equipment and other effects of returning troops were disinfected at quarantine stations. Some impatience on the part of the commanding officers of returning troops was exhibited at the delay caused by the quarantine inspection and disinfection of baggage. The commanding officer of troops arriving on board a vessel at Tampa Bay quarantine station, upon being advised that it would be necessary to inspect his troops and disinfect baggage, replaced the baggage and reembarked his troops on board the transport and sailed for Port Tampa, the point of landing, in violation of quarantine regulations. The Secretary of War was immediately notified and, at the suggestion of the Marine Hospital Service, the commanding officer of these troops was directed to return the baggage to the quarantine station at Tampa, for compliance with the regulations. The railroad company was notified that to accept such baggage without disinfection would be a violation of the United States quarantine law and would subject it to a penalty. The Collector of Customs was directed to refuse entry to the vessel. The baggage was duly sent back to the quarantine station and processed as required. Fortunately, few such incidents occurred, as in general there was excellent cooperation between the military authorities returning the troops and officers of the Marine Hospital Service. At Montauk Point, New York, where large numbers of returning troops were landed, the disinfection of baggage and quarantine inspections were conducted for the port of New York.

Modern public health administration on the part of the Federal Government received its greatest impetus from the Spanish-American War

together with the occurrence of pandemic diseases before and after the war, especially plague and yellow fever.

The results of the war with Spain placed marked additional responsibilities upon the quarantine system maintained by the Marine Hospital Service. With the return of troops from Cuba and Puerto Rico following the cessation of hostilities, the ever-present threat of importation of yellow fever and other tropical diseases was constantly in mind. During the war with Spain several medical officers of the Service were assigned on Army transports carrying troops back and forth to the newly-acquired insular possessions. After the occupation of Cuba by American troops, the quarantine system for Cuba was established and operated for a time by the Marine Hospital Service.

Insular Quarantine

Following the war with Spain came the necessity of establishing the maritime quarantine system in Cuba, Puerto Rico, and the Philippine Islands. An Executive Order of January 4, 1900, directed the Marine Hospital Service to take charge of the quarantine work in the Philippine Islands. The development and administration of a quarantine system for the Philippine Islands presented a real problem, as through the intimate commercial relations between Manila, Hong Kong, Calcutta, Bombay, and other badly infected ports, there was the ever-present threat of the introduction of plague, smallpox, cholera, or other dangerous epidemic diseases. An Act approved April 12, 1900, provided for the extension of the quarantine system to Puerto Rico. Another Act approved April 30, 1900, provided for the quarantine system to be applied to the Hawaiian Islands.

The responsibility of establishing the quarantine service in the Philippines was entrusted to a young Service officer, Dr. James C. Perry, who was instructed in 1900 to proceed to Manila for the purpose of establishing a quarantine system, the details being left to his judgment. He handled the situation effectively and established the quarantine service with credit to himself and to the United States Marine Hospital Service. The quarantine system for the Panama Canal was inaugurated in 1905. By an Executive Order dated September 27, 1917, the Virgin Islands ports were included in the United States quarantine system.

In 1911, cholera cases developed on vessels arriving at the Port of New York from Italy. The Public Health and Marine Hospital Service sent officers to that station, which at that time was operated by the State. They initiated and put into effect a system of bacteriological examination of all passengers from Italian ports to detect "cholera carriers"—thus eliminating the period of detention. Formerly, travelers exposed to the infection were held in detention for the period of incubation of the disease, i.e., five days.

World War I

Following cessation of hostilities in 1918, travel from Europe was resumed on a large scale. Because of severe epidemics of typhus fever in European areas and the anticipation that typhus infection might well be a menace to United States ports, the Public Health Service sent officers to various European ports to supervise precautionary measures at ports of embarkation. Steamship companies were required to establish bathing and disinfection facilities to insure the delousing of passengers from infected areas. Service officers supervised such procedures and made terminal inspections as a prerequisite to issuance of bills of health.

When one government refused to permit the Service officer attached to the consulate to function in that capacity, ships arriving at New York were held in detention for the period of incubation of twelve days and passengers deloused at the New York Station—all at the expense of the steamship company. Likewise, the ships were penalized for sailing from foreign ports without an American bill of health. The government concerned very promptly requested that the Public Health Service officer resume his duties at the port of embarkation.

The coordinated efforts at ports of embarkation and at United States ports of arrival effectively prevented the entrance of typhus into the United States and, to a great extent, limited the occurrence of the infection on board ships in transit to America.

With the accumulation of scientific knowledge relating to the spread of the major pestilential diseases, the quarantine work of the Service was adjusted to insure the application of such advances in the methods of disease prevention and control. The ever-present menace of yellow fever that hovered over the southern States in the latter part of the 19th

Century and early part of the 20th Century is no longer a major concern of the Public Health Service, and the vast improvement in our water supplies has very effectively removed the severe threat of cholera that once was present. Bubonic plague, although still present in the Orient, is not as immediate a potential threat to our seacoast cities as it was in the early days before improved methods of control were developed. The control of plague has developed along two lines: the application of effective means of killing rats and fleas, and the ratproofing of ships to eliminate rat harborages.

Fumigation

From remote antiquity, burning of resins, pitch, tar, bitumen, saltpetre, and various aromatics as incense, myrrh, and cedar oil, has been practiced to combat epidemics or prevent putrefaction. Sulphur, while known to the Israelites, seems to have been introduced later for this purpose, probably by the Greeks. About 1722, Deslandes, in France, suggested fumigation with sulphur to disinfect the interior of ships.

For many years fumigation by burning sulphur was the principal method utilized on ships. Because of the long recognized deficiency of sulphur dioxide that had been the chief fumigant relied upon for centuries, the Public Health Service in 1913, at San Juan, Puerto Rico, tentatively adopted hydrocyanic acid gas as a fumigant in quarantine work. Dr. Richard H. Creel had used this fumigant for ships and buildings to a limited extent during a plague outbreak in San Juan in 1912. Sulphur dioxide was objectionable in that it discolored light-colored paint, injured hangings, upholstery and other fabrics, was a fire hazard, and was lacking in diffusiveness. It failed to destroy rats or insects that had any degree of coverture. The introduction of hydrocyanic acid gas was the most important contribution made to quarantine procedure since the establishment of that system. At first, the agent was used in relatively high concentration and for prolonged exposure, regardless of whether the objective sought was destruction of rats, mosquitoes, or the other insects. These factors were of weighty consideration to ship owners who had to bear the cost of fumigation and expense of the vessels' detention.

Experiments carried out by Doctor Creel, Dr. Frank M. Faget, and William D. Wrightson, a sanitary engineer, at New Orleans in 1915 made possible the establishment of standards of exposure and concentration of the gas, according to objective sought—low dilution with brief exposure for mosquitoes and correspondingly higher concentration for rats and some vermin. The results made for a lower cost of fumigation and a much shorter detention period for ships.

Despite the efficiency of cyanide gas, it became apparent that it was unduly hazardous to human life in the routine fumigation of ships. Adequate safeguards were formulated by the Public Health Service through the issuance of circulars of instructions and the furnishing of blower fans. Captive animals, such as canary birds, were utilized for the detection of fumes in lethal amounts, but accidents among operating personnel continued and it was necessary to provide some automatic "foolproof" safeguard such as combining a tear gas with the cyanide fumigant. The first experiment with tear gas was unsuccessful because the lachrymating element was either too heavy and remained in ship compartments long after the cyanide gas had been dissipated or otherwise was not equally diffusive with the cyanide element.

The problem was taken over by Dr. Lewis R. Thompson, then in charge of Industrial Hygiene Investigations. After a series of extensive tests, a very satisfactory and effective fumigant was developed, cyanogen chloride. This gas was quite as lethal as hydrocyanic acid gas and provided a lachrymating element that served as a warning to quarantine and ship personnel. No fatalities or accidents occurred during the years that this agent was used. Eventually, the fumigant was provided by a commercial company in liquid form, and from a reservoir on deck it was conducted by hose to the compartments to be treated, where it volatilized, with a great saving in time and of personnel. Subsequently, during the course of years, various lethal gases with lachrymating elements have superseded cyanogen chloride—more especially, cyanide gas with five percent chloropicrin as the warning element. The generative method of producing hydrogen-cyanide gas instituted at San Juan and New Orleans was gradually replaced as a result of experiments in New York conducted by Dr. Charles V. Akin and Dr. Grover C. Sherrard. Eventually HCN Discoids, a derivative of a German product marketed under the

trade name of "Zyklon B," came into use. HCN Discoids, to which five percent chloropicrin (tear gas) has been added as a warning gas to man, is the fumigant most commonly used at present for rodent destruction on ships.

For many years ships were periodically fumigated. A method has now been perfected whereby a careful inspection is made to determine whether fumigation is needed. By carefully studying the rat runs, droppings, and other evidence, the number of rats on board ship can be determined with surprising exactness. The need for fumigation is predicated on the demonstrated presence of rats in significant numbers. An estimate of ten rats or more on a vessel from a port known to be plague infected, is considered to be indicative of the need for fumigation.

Another effective method of rat control on ships, that of using the poison compound "1080" (sodium fluoroacetate), was developed in 1945 by Dr. Gilbert L. Dunnahoo with the assistance of Dr. John H. Hughes, an entomologist of the Service. The "1080" poisoning program is utilized by the major quarantine stations on approximately one-half of all ships on which rat control measures are required. Since "1080" does not kill fleas, it is supplemented by use of an insecticide such as DDT applied around the "1080" poison stations, along rat runways, and around rat harborages.

Ratproofing of Ships

Pharmacist Benjamin E. Holsendorf, with encouragement and cooperation from Dr. Samuel B. Grubbs, in 1920 began to develop ratproofing work for ships. The term "ratproofing" as it relates to ship construction, is the application of procedures designed to eliminate or render inaccessible to rats those spaces capable of affording protected harborage where rats may successfully obtain shelter or may nest, breed, or obtain food. Ratproofing of ships has been developed on a voluntary and cooperative basis between the Public Health Service, shipbuilders, and ship operators.

The Quarantine Regulations of the United States required at one time that all ships engaged in foreign trade be fumigated every six months. This provision was based on the principle that the best protection against plague was to keep the rat population on ships to the lowest

possible point. It was recognized that certain types of vessels in passenger trade between some countries and the United States afforded slight danger from the standpoint of plague and at the same time could be fumigated only at considerable cost. It was therefore arranged to extend the period of fumigation for these ships under certain conditions, one of which was that the vessel should be "constructed so as not to favor or encourage the harborage of rats." One of the finest and largest passenger vessels afloat was chosen for the demonstration. For several months before beginning the work of ratproofing, conditions on the vessel were studied and, as a result, certain procedural and structural changes were made and eventually the ship was completely ratproofed. It was soon demonstrated that the cost of ratproofing was more than offset by the reduction in the expense occasioned by the delay resulting from fumigation in addition to the damage to foodstuffs and other supplies caused by the rats on non-ratproofed ships. The economic value of ratproofing was readily realized by steamship companies. It was recommended to the U. S. Maritime Commission that a clause be inserted in all Government contracts for the construction of new ships, to the effect that vessels were to be constructed ratproof in accordance with U. S. Public Health Service specifications. Maritime Commission representatives concurred, and in 1930 this was established as a routine procedure. The work progressed at the New York Quarantine Station under a small organization whose function was to render advice and promote ratproofing procedures both on ships under construction and on ships already in service. The work gradually became national in scope and involved all types and sizes of ships. The enormous increase in new construction had been foreseen by those responsible for ratproofing work at New York, and steps were taken July 1, 1941, to train additional personnel for ratproofing inspections.

On January 1, 1944, the Field Headquarters Office of Ship Ratproofing was transferred from New York to Washington, D. C., and the work was consolidated with other sanitation activities pertaining to vessels under the direction of the Sanitary Engineering Divison.

Non-Medical Inspection Officers

Because of the extreme shortage of physicians during World War II, in 1944 the use of non-medical inspection officers for routine quarantine

inspections was inaugurated at maritime and air quarantine stations. These carefully chosen quarantine inspection officers are experienced and trained technicians. This marked a change in the policy of using medical officers for quarantine inspections that had been in effect since the beginning of quarantine work in 1878. A medical officer is in charge of each quarantine station and, where there is any doubt in the mind of the quarantine inspection officer regarding any case, the Medical Officer in Charge is summoned immediately to make a decision as to the medical condition involved.

Air Quarantine

With the development of international aircraft service, measures were instituted to prevent the introduction of diseased persons and disease-carrying insects and animals into the United States. The "Air Commerce Act of 1926" was approved May 20, 1926, and the Public Health Service began quarantine and immigration inspection for air travel in 1927. Meachem Field, on the Island of Key West, Florida, was designated an airport of entry on December 20, 1927, at which time the Public Health Service made arrangements for performance of inspection and quarantine duties; later in the year similar arrangements were made at New York City and Tampa, Florida. During the fiscal year 1929 this work was extended to Miami, Florida, where the Pan American Airways established an airport at Hialeah for its planes which carry mail and passengers from Cuba, Puerto Rico, and Central and South America. This work soon expanded to other locations, and the number of aircraft inspections gradually increased from 5,384 in 1930 to 47,113 planes in 1949.

The rapid expansion of airplane service to the United States and the increased incidence of yellow fever in some foreign countries not only required greater vigilance on the part of quarantine officers to prevent the introduction of this disease, but also made necessary the development of new and more effective precautionary measures. Accordingly, on July 23, 1931, the Public Health Service undertook studies to determine the presence of insects, particularly *Aedes aegypti* mosquitoes, on aircraft arriving in the United States from tropical ports. During the sum-

mer of 1931, Dr. Thomas H. D. Griffitts inspected 102 aircraft arriving at Miami, Florida, from Central and South America, the Caribbean and Mexico, and observed the presence of 29 mosquitoes on 21 planes. Doctor Griffitts also demonstrated the ability of *Aedes aegypti* mosquitoes to survive in aircraft for approximately 80 hours while traveling great distances and at altitudes as great as 14,000 feet.

In 1935, Dr. Charles L. Williams, Sr., and Dr. Waldemar C. Dreessen, at the New Orleans Quarantine Station, demonstrated the effectiveness of pyrethrum mixed with refined kerosene as an insecticide spray and recommended it for the control of mosquitoes on airplanes. This mixture was later replaced by the more effective freon-propelled insecticidal aerosol containing pyrethrum and DDT.

Dr. Gilbert L. Dunnahoo, while on detail at the Miami Quarantine Station from 1938 to 1942, conducted valuable studies on aircraft disinsectization. He set up an *Aedes aegypti* Control Unit, the purpose of which was to train personnel in aircraft disinsectization procedures and to conduct surveys and demonstrations in this work. During the fiscal year 1941, he established aircraft disinsectization bases at Barranquilla, Colombia, and Maricaibo, Venezuela. At that time inspection bases were set up at Kingston, Jamaica, and Port-au-Prince, Haiti, and supervised by personnel of the Public Health Service who had received special training in *Aedes aegypti* work. The aircraft were subsequently given entomological inspections on their arrival at designated Caribbean ports and finally at Miami. Doctor Dunnahoo, especially interested in the control of disease vectors that are transported by aircraft, was the first to employ a freon-propelled aerosol on aircraft. The Public Health Service has done important work in the improvement and standardization of insecticides for use on aircraft, and methods of disinsectization. Recommendations of the Service are widely accepted in world aviation. It is well known that new species of several different insects have been introduced into the United States by means of aircraft. Constant vigilance is necessary to detect the arrival of new species of mosquitoes and other insects that may be of public health importance in spreading disease in this country. In the southern areas where large numbers of aircraft arrive from foreign countries, a constant check is kept on insects in and around the airports.

Interdepartmental Quarantine Commission

During World War II there were several newspaper and magazine articles that tended to stress the danger of epidemics of strange and exotic diseases being imported into the United States when our troops returned from the widely scattered tropical areas of the world where they were then serving. There was sufficient concern with regard to this in the public mind to warrant a conference of the Surgeons General of the Public Health Service, the Army, and the Navy. It was agreed that the whole problem of effectiveness of the present quarantine system to prevent the introduction of epidemics should be studied. Accordingly, an Interdepartmental Quarantine Commission was established to study the quarantine systems of the various countries and to endeavor to evaluate the threat of introducing new diseases into this country by the return of American troops from tropical countries.

To familiarize themselves with conditions in the tropical areas from which our troops would be returning, members of the Quarantine Commission traveled extensively throughout the world. Later the Commission drafted regulations governing quarantine procedures for returning troops. The total problem of quarantine as it relates to air and maritime commerce was also carefully considered. No radical changes in existing quarantine procedures were recommended by this Interdepartmental Commission.

The introduction of exotic tropical diseases by returning troops did not materialize. The Interdepartmental Quarantine Commission submitted its final report under date of June 10, 1944. This Commission consisted of Medical Director Gilbert L. Dunnahoo of the Public Health Service, Chairman; Captain Thomas B. Magath, United States Naval Reserve; and Lieutenant Colonel Phillip T. Knies, Medical Corps, Army of the United States.

As a result of this study by the Quarantine Commission, the Army, Navy, and Air Force have designated quarantine liaison officers who keep in constant touch with the Public Health Service on matters of quarantine affecting those services. This proved materially helpful during and since World War II.

Present Need for Quarantine

Some public health workers feel that there should be an abandonment of quarantine restrictions. They reason that should any of the major pestilential diseases find their way to the United States, it would be relatively easy to control them because of improved sanitation and the more precise methods of disease control. However, as in other health matters prevention is better than cure and often far less expensive. Perhaps the wiser and more satisfactory course has been followed by the Service in relaxing controls whenever possible and removing needless quarantine restrictions on commerce. To abandon completely all quarantine restrictions would be as undesirable as the maintenance of strict and inflexible quarantine methods. The fact that there are quarantine inspections serves as a definite deterrent on the transportation and the possible introduction of the major epidemic diseases into our country.

Another bar to the discontinuance of maritime quarantine is in the agreements entered into between the Public Health Service and local and State governments at the time of the transfer of quarantine stations to the Federal government. The Service committed itself to the obligation of preventing the admission of any of the quarantinable diseases into the ports of the United States.

While it is true that the control of plague, cholera, yellow fever, and typhus would be relatively easy, the expense of control work would devolve on the local community, unless the Federal government agreed to finance the work of eradication. Furthermore, the publicity of a single case of plague, cholera, or yellow fever in a port, would involve commercially detrimental quarantine restrictions by foreign countries. With good reasons, therefore, local communities look to the Federal government to exclude epidemic diseases rather than that they should bear the cost and dislocation of interstate and foreign commerce incident to the appearance of such diseases in their ports.

The continuance of the maritime quarantine system means the continuance of sanitation of overseas shipping and the observance of precautions by shipowners and masters.

Interesting Quarantine Incidents

The following incidents relating to quarantine procedures and bubonic plague are significant in that they demonstrate the danger of the introduction of plague by means of infected rats.

The Japanese Steamship *Nippon Maru* arrived at San Francisco on June 27, 1899, with a record of two cases of human plague on board between Hong Kong and Honolulu. No illness or suspicious symptoms were noted in either passengers or crew on arrival at quarantine. However, because of the history of recent human plague on board, it was decided to detain the vessel in quarantine. When the passengers and crew were inspected on the afternoon of June 27, 11 Japanese stowaways were present. When the crew was transferred to detention quarters at the Angel Island Quarantine Station the next day, two of the stowaways were missing. Their bodies bearing life preservers from the *Nippon Maru* were recovered later from the bay. Post mortem examinations made by the City Health Department showed plague bacilli in smears and culture from enlarged glands.

On January 31, 1900, the Japanese Steamship *Nanyo Maru* arrived at Port Townsend, Washington, with a history of illness en route. There was one death at the quarantine station with symptoms chiefly of beriberi, but the quarantine officer was unwilling to accept this diagnosis because of the general glandular enlargement. The passengers and crew of the vessel were held in quarantine to await bacteriological examination of some of the tissues from the body of the deceased person. The result of the examination confirmed the suspicion of plague. Altogether, there were 17 cases and three deaths among the passengers and crew. The quarantine officer (Dr. Milton H. Foster), now retired, who performed the autopsies with his bare hands (rubber gloves were not available) on these three fatal cases, recalls distinctly his concern for his own safety when the diagnosis of plague was established.

When the British Steamship *Trevelyan* arrived at New Orleans Quarantine in ballast in April 1916, from Karachi, India, via European ports, the ship was promptly fumigated with sulphur. The ship was then searched for dead rats, and 28 were found. Trapping on the ship secured

10 more. All were sent to the laboratory for examination. One of the 28 proved to be plague infected.

The Steamship *Managua* arrived in New Orleans in December 1919, with a cargo of bananas from Nicaragua. She was unloaded and fumigated on December 24, 1919. Fifteen rats were recovered, one of which was plague infected.

The Steamship *Historian* arrived in New Orleans in February 1920. During the previous year she had been in New Orleans, Calcutta, and Liverpool. Upon fumigation on February 12, 48 rats and one mouse were recovered. One rat was found to be plague infected.

Current Quarantine Work (1950)

At the present time (1950), unless specifically exempted by regulation, every ship, aircraft, or other carrier entering a port under control of the United States is examined for purposes of quarantine. The character and thoroughness of this examination are based on an evaluation of all factors bearing on the possibility of the carrier introducing a quarantinable disease into the United States. Ships and aircraft from specified quarantine exempt (clean) areas are not inspected. Those trading in known infected ports are subjected to fumigation and such treatment of persons as may be considered necessary to prevent the introduction of disease.

Quarantine measures in current use are, generally: (1) those taken against the quarantinable diseases at foreign ports, (2) those taken at ports of arrival, and (3) the general requirements at quarantine stations.

In addition to the presently designated quarantinable diseases—plague, cholera, smallpox, typhus, and yellow fever—quarantine measures provide for the control of certain other diseases that might be introduced by imports of animals or "things."

In 1946 the Foreign Quarantine Regulations imposed restrictions on the importation of cats, dogs, and monkeys, primarily as an anti-rabies precaution. In 1949 the rabies vaccination requirement for cats and monkeys was discontinued, but these animals are still given a physical inspection on arrival, and monkeys coming from an endemic yellow fever area are required to be detained in a mosquito-proof structure for at least nine days immediately prior to arrival.

Radio pratique means the issuance by radio of permission to enter a port, such permission being given to a carefully selected class of passenger vessels that carry certified ships' surgeons. Any inspections indicated are accomplished after docking. The plan was first inaugurated at the Port of New York on February 1, 1937. It has been extended as conditions warrant to serve other major ports.

Psittacosis

Psittacosis is another disease that is watched closely by the quarantine officers. The first extensive outbreak of psittacosis in the United States occurred in the latter part of the calendar year 1929. During the period November 23, 1929, to December 31, 1930, 170 cases of psittacosis, with 33 deaths, were reported. The cases were distributed in 16 States and the District of Columbia, and were exclusive of 16 laboratory infections with two deaths, and of 12 probable cases that were removed from two merchant ships which entered United States ports with parrots which had been purchased in Germany and Brazil.

The 1929-30 outbreak of psittacosis resulted in promulgation of Executive Order No. 5264 of January 24, 1930, which prohibited the importation of parrots into the United States, its possessions and dependencies, from any foreign port except under such conditions as might be prescribed. On February 3, 1930, regulations were approved prohibiting for the time being the importation of parrots. After careful consideration by the Public Health Service and after a conference with representatives of the Pet Dealers Association of America and members of the Biological Survey of the U. S. Department of Agriculture, these regulations were modified in October 1930 to permit the importation of commercial shipments under approved sanitary restrictions relating to crates, air space, and other conditions of transportation, and when accompanied by a certificate from the duly constituted sanitary authority at place of origin attesting to the health of the birds and to the sanitary conditions of the importing aviary or other distributing establishments. The entry of shipments, however, was restricted to United States ports at which Federal quarantine detention facilities were maintained, and all shipments were detained for a 15-day observation period. Later these regulations were extended to apply to all birds of the parrot family.

On December 20, 1933, the Interstate Quarantine Regulations were amended to provide for the control of interstate shipments of psittacine birds. The quarantine officers worked in close cooperation with the State health authorities and, prior to the release of a shipment from quarantine observation, the health authority at the point of destination was notified and furnished certain pertinent information, together with a certificate of release from quarantine. Several States had promulgated regulations prohibiting the importation of birds of the parrot family into the State. The adoption and enforcement of these regulations were followed by a reduction in the number of cases of psittacosis in the United States. Under the present regulations, entry of commercial shipments of psittacine birds into the United States for purposes of trade is prohibited. For each person not more than two birds known by their owner to have been isolated for two years and not for sale or barter are allowed entry. Those destined for a zoological park or research institution, are also allowed entry under similar restrictions.

Immigration

FIRST IMMIGRATION LEGISLATION

The first Federal census report of 1790 gave the population of the 13 States as 3,329,214. The first national legislation which had a bearing upon the regulation of foreign immigration was enacted in 1819. It concerned the carrying of passengers at sea, prescribing the minimum deck space per passenger carried. It provided also that the master of the vessel arriving in the United States from a foreign place was to deliver to the collector of customs a list or manifest of all passengers carried by him. The collector in turn was required to render a quarterly report to the Secretary of State who was directed to render an annual report to Congress. The first official report of the Secretary of State on immigration to the United States covered the fiscal year ended September 30, 1820. Since July 1, 1843, the Government's fiscal year covers the period July 1 to June 30.

It is uncertain how many immigrants arrived from the close of the Revolutionary War to 1820 when statistics for immigration were first officially recorded. Such statistics were collected by the Department of

(From USPHS Records)

U. S. Quarantine Station, Rosebank, Staten Island, New York, 1950.

(From USPHS Records)

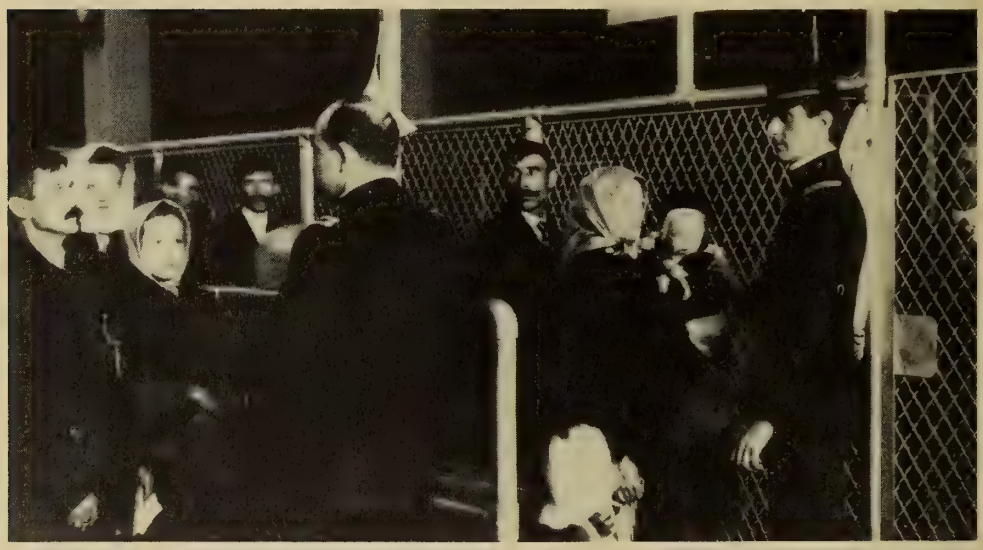
Airplane stewardess releases insecticide 30 minutes before landing in United States from a foreign country.

(From USPHS Records)

Quarantine boarding launch, "W. H. Welch," New York Harbor, 1950.

(From USPHS Records)

Vaccination of agricultural workers against smallpox before entering United States at Mexican border, 1949.



(From USPHS Records)

Line inspection of arriving immigrants, Ellis Island, New York, about 1910. Officer on left, Dr. William O. Wetmore; on the right, Dr. Herbert M. Manning.

State from 1820 to 1874; by the Bureau of Statistics from 1867 to 1895; and since 1895 by the Bureau of Immigration, now called Immigration and Naturalization Service, first in the Department of Labor, but latterly in the Department of Justice.

The trend of the volume of foreign immigration to the United States was decidedly upward from 1820 to 1920. According to official records, almost 38,000,000 (37,981,462) immigrants arrived at the several United States ports during that 100 years. Of this great volume of immigration 70 percent occurred during the 40-year period from 1881 to 1920 after which the "Old" immigration lost its ascendancy to be replaced by the "New." During the period from 1901-1920, 53 percent of the total 100 years of immigration took place in that 20-year span and in the period 1911-1920, 30 percent, or almost one-third of 100 years of immigration occurred during that decade. In terms of volume the more crucial periods of our immigration problem took place during these two decades and the second of these exceeded the immigration of the first. The average yearly arrival of immigrants, 1901-1910, was 879,500, whereas the yearly average, 1910-1920, was 1,006,000.

During World War I popular acclaim developed for the enactment of laws to curtail foreign immigration or to suspend it. The so-called percentum limit plan first effective on May 19, 1921, was made permanent in May, 1924. It provided that the annual immigration of any nationality be limited to two percent of the number of foreign-born of such nationality resident in the continental United States in 1890. Quotas for each nationality were set up by regulation and under these quotas foreign immigration was henceforth drastically reduced.

From 1820 to 1883 more than 95 percent of the total immigration from Europe originated in Britain, Ireland, Germany, Scandinavia, the Netherlands, Belgium, France, and Switzerland. The movement of this population is usually termed the "Old Immigration." In 1883 an increased movement of population began from southern and eastern Europe. This has been called the "New Immigration." The so-called quota limit plan for immigration sought, theoretically at least, to maintain and perpetuate the same ethnic qualities in future immigration as that represented by the "Old Immigration."

EVOLUTION OF FEDERAL CONTROL OF FOREIGN IMMIGRATION

During the period 1860-1865, sentiment throughout the country was favorable to foreign immigration. Immigration was encouraged, naturalization laws were made more liberal, and in 1864, on Presidential recommendation, Congress sanctioned the importation of contract labor, the appointment of a Commissioner of Immigration with offices in New York to arrange for the transportation and care of immigrants until reaching their destination, and, finally, to make preparations to appoint special agents in Europe to promote and assist immigration. Eventually this movement proved unpopular and the Act of 1864 was repealed in 1868.

Following this a reactionary period set in against immigration which reached a total of 387,203 persons in 1870, the highest for any previous year. Then, too, the problems of pauperism, vagrancy, crime, and care of the insane increased rapidly among the foreign-born, and national opinion gradually turned to the Federal Government for aid in restricting immigration. In 1874 an investigation conducted by the State Department proved that foreign officials were deporting to the United States foreign convicts, paupers, idiots, insane, and those incapable of self support.

The immensity of the immigration problem and the social problems which it engendered were rapidly growing beyond the control of State jurisdictions. This was made evident by memorials and recommendations of several States requesting national aid of some sort. It came in 1876 when, by a decision of the Supreme Court, all State laws regulating immigration were declared unconstitutional and the authority for its regulation was declared vested in the Federal Government alone. In 1868 by treaty with China, the right of naturalization of Chinese was denied in the United States and in subsequent Acts Chinese immigration was excluded.

The declaration of the Supreme Court left suspended the means by which the separate States could care for the thousands of physically and mentally disabled who came to their shores. Urgent requests were then sent to the National Government to support the work heretofore carried on by State immigration agencies.

LATER IMMIGRATION LEGISLATION

It was not until 1882, six years after State regulation was declared unconstitutional, that the first Federal immigration law was enacted. This new law was not entirely satisfactory. In 1885 a law forbidding the importation of contract labor was approved. These new laws proved defective, and a more comprehensive Act was passed by Congress becoming effective on April 1, 1891. The chief features of the latter prohibited the immigration of idiots, insane persons, persons insane within five years of the date of application for admission, and persons having had two or more previous attacks of insanity. It prohibited immigration through advertisements in terms of promised employment; imposed fines for transporting inadmissible aliens; required more detailed reports of masters of vessels carrying immigrants; created an office of immigration in the Treasury Department; provided for deportation within one year of persons entering unlawfully or becoming a public charge; and required that henceforth the medical examinations of arriving aliens were to be made by officers of the United States Marine Hospital Service.

The imposition of this duty upon officers of the Service was the first concerted and organized effort on the part of any Federal governmental agency to inaugurate and place into effect measures which sought to safeguard our population from a possible increase in the number of mentally disordered and defective persons, to safeguard it from a possible increase in the numbers who might become public charges, and to eliminate from admission those suffering from loathsome, contagious diseases not covered by national quarantine laws and regulations.

Aside from the Acts of 1882, 1885, and 1891 already mentioned, Congress modified, amended, and strengthened the immigration laws in 1894, 1895, 1901, 1903, 1907, 1917, 1920, 1922, and 1924. A literacy test for immigrants was required by Congress in 1896 but was vetoed by President Cleveland, and a similar bill was later vetoed by President Wilson. Perhaps there has been no phase of national legislation which has so greatly occupied the interest and concern of Congress. Subsequent to World War II, certain modifications were made in the immigration laws with special reference to the admission of displaced persons. The more recent legislation has reference to the exclusion of those identified with subversive organizations.

Our national history is replete with evidence that measures were taken to encourage foreign immigration and also to restrict and regulate it. A unity and consistency of opinion has existed, however, as to the desirability of excluding the mentally ill and the socially misfit immigrant. In terms of policy this was the consistent aim during the colonial period, later of the several States, and finally in Federal regulation.

PORTS OF ENTRY

Within a short period of time, subsequent to the enactment of the immigration law of 1891, some 50 American ports had been designated as ports of entry for immigrants. In accordance with the mandate of Congress medical officers were assigned to duty at these ports for the conduct of the medical examination of aliens. New York was the largest of these ports and continues as the principal port of entry for immigrants.

Mention has already been made of the significant increase in immigration during the first 20 years of the present century and of the greater increase during the decade ending 1920. Whereas the turning point in foreign immigration from southern and eastern Europe began in the early eighties, it did not attract much attention until later. In 1896 it was the subject of special inquiry by a Congressional Committee and early in the present century was the subject of a study by a Congressional Commission on Immigration, the results of which were published in 24 volumes.

During the earlier period of Federal control, subsequent to 1891, the immigration services at the port of New York were conducted at the battery in a building known as "Castle Garden." This was soon thereafter abandoned and later used and known as the "aquarium." It was replaced by the acquisition of Ellis Island, comprising three small islands in New York harbor contiguous to the New Jersey shore. An administration building and detention quarters for immigrants were erected on island one, a general hospital on island two, and a communicable disease hospital on island three. Thus, Government-owned and operated facilities were established for the detailed administration of the immigration laws and the care of immigrants at the port of New York.

Headquarters were established at the Battery in lower Manhattan as a base for officers who conducted the inspection and examination of

cabin passengers aboard arriving vessels. About 1910 an annex was built to the general hospital on Ellis Island to accommodate the psychopathic services. These facilities were enlarged in the subsequent years of increased immigration through the port of New York.

Oftentimes when an immigrant first reached the registry floor at Ellis Island, he moved along in line without realizing that he was undergoing scrutiny by a medical officer until the medical officer addressed him with some question to test his hearing and mental alertness preliminary to a physical inspection. This more or less constant questioning of immigrants required the use of sentences in more than one language, sometimes English, French, Italian, German, Polish, Swedish, or Norwegian. The medical officer was usually able to decide on the sentence to be used by judging the appearance, dress, or racial characteristics, but occasionally he missed it. Sometimes amusing incidents occurred. The following is an example: The medical officer asked the name of an immigrant in many languages except English. Finally the doctor said to himself aloud: "What language can he possibly speak?" The immigrant promptly replied: "Doctor, I spake Irish."

The diseases and disabilities seen by medical officers at Ellis Island varied greatly, prevailing as they did among representatives of races assembled from every quarter of the globe. Out of an average of more than 900,000 persons passing through that station annually, over 8,000 fell by the wayside because of sickness or other disability and had to be taken care of until recovery, death, or deportation.

In this hospital at Ellis Island there was a cosmopolitan clientele. Practically every nationality and every race were represented at one time or another, and almost every disease and disability. In making morning sick call, a medical officer might find the first bed occupied by a Greek suffering from aestivo-autumnal malaria; the next by a South African miner suffering from silicosis; the next by a Chinese with beriberi; and the next by an Italian with trachoma.

At other less active ports of entry than Ellis Island, smaller administrative units and detention quarters were established with adjuncts for medical examination and medical observation. At even smaller ports characterized by less immigration, medical accommodations for observation and diagnostic purposes were furnished by contract with existing

community hospital facilities. Formal ports of entry for immigrants are designated along the Atlantic, Gulf, and Pacific Coasts and along the Canadian and Mexican borders and are known as immigration stations.

IMMIGRATION MEDICAL SERVICES

The principles involving the so-called immigration medical services include a medical inspection of arriving aliens when presented for the purpose by the Immigration and Naturalization Service. The inspection is but a preliminary step seeking to detect those who may be suspected of an acute intercurrent illness, of a communicable disease, of physical handicaps which may affect their ability to earn a living, and to detect the general reactions and attitudes of individuals which may lead to the suspicion of mental disease and defect. Sometimes the detection of these physical and mental conditions is aided by the reports of observations made during the voyage and appearing on the ship's manifest or passenger list.

The observation of symptoms suggestive of an intercurrent illness are pursued further and, if indicative, the individual is hospitalized for observation and medical treatment. The scope of these illnesses embraces all surgical and medical categories including acute, subacute, and chronic. Obviously, the general hospital accommodations must meet these diversified needs in terms of both equipment and personnel.

Those suspected of having a communicable disease are at once segregated and after confirmation of the diagnosis they are admitted to the communicable disease hospital for care and treatment. The scope of these illnesses includes those which are ordinarily called the contagious diseases of childhood, suspected tuberculosis, trachoma, and others designated in regulations as "dangerous contagious diseases." But the scope also embraces many exotic communicable diseases not ordinarily encountered in the United States, but which are more or less indigenous to other and perhaps more remote parts of the world.

With respect to those suspected of mental disease or defect, a somewhat similar procedure is followed. In some instances, more especially for those suspected of being mentally defective, hospital accommodations may or may not be necessary, and observations and intensive examination

may be conducted incident to the detention facilities for ambulant immigrants pending immigration hearings and adjudication.

During the period 1901-1920, but more especially during 1911-1920, when the volume of immigration exceeded any previous period, the facilities, accommodations, and personnel concerned with psychiatric disorders were greatly expanded. More extensive hospital accommodations for such disorders, both for observation and temporary care pending eventual disposition, were provided during this period. This was an era of more intensive study of the means and measures employed for better assuring the detection and diagnosis of mental disease and defects among immigrants. Intelligence tests applicable to immigrants were perfected, and new ones were devised. This intensive analysis of the omissions and commissions, involving the detection and recognition of mental diseases and defects among immigrants arriving at Ellis Island, was eventually crystallized in a manual for use by Service officers as a guide in the detection and certification of immigrants with various forms of mental diseases and defects.

Since 1891 Service officers assigned to immigration duty have served in the conduct of both the clinical and the medical administrative capacity which such assignments have entailed. Their administrative and clinical experiences have been utilized in the conduct of other Service activities wherein such experience proved valuable.

A TURNING POINT IN IMMIGRATION CONTROL

During World War I when foreign immigration practically ceased, agitation developed for the enactment of laws that would curtail the influx of immigrants expected on the cessation of hostilities. This expectation was in part correct, for in 1920 almost 650,000 immigrants arrived and in 1921 almost one million (991,942).

This agitation found expression in legislation by Congress. The House of Representatives approved, on December 13, 1920, a bill providing for temporary suspension of all immigration. The Senate proposed the substitution of the so-called "percentum" limit plan of restriction, and this prevailed though it failed to become a law and was reintroduced in the succeeding 67th Congress. It became effective in May 1921. The Act, however, expired by limitation on June 30, 1922, but under joint

resolution approved May 11, 1922, its operation was extended to June 24, 1924. In 1923-1924 popular demand continued for more stringent restriction of immigration and for the passage of a law in keeping with the policy of a percentum plan. Accordingly, legislation by the 68th Congress approved by the President under protest on May 26, 1924, became effective July 1 of that year.

Synchronous with this and incident to the popular clamor following World War I for restricting immigration, a special study was made in western European countries on the influence of that war on prospective immigration, and of the additional measures that should be employed in connection with it. This study was conducted late in 1920 by Commissioner General Anthony Caminetti and Inspector Aloysius R. Wiggins of the Immigration Service, accompanied by Assistant Surgeon General John W. Kerr of the Public Health Service. A report regarding it was submitted in January 1921 before the Committee on Immigration of the House of Representatives.

One feature of the Immigration Act of 1924 provided for American consular visas for persons who intended to emigrate from abroad. Thus, an American consular inspection for prospective immigrants, first advocated in Congress in 1838, did not become a reality until almost a century later. Until 1924 no system had been devised for the receipt of medical information testifying to the absence of physical and mental diseases and disorders among immigrants before departure from their homeland. Until that year the selection of American immigrants abroad had been left, in very large measure, to foreign agents of transatlantic steamships.

The Act of 1924, however, required that such testimony be supplied by prospective immigrants from local medical sources of their own choosing. The experiences of the first year indicated that American consular officials could not depend upon these unofficial medical certificates for immigration purposes. Such experience tended to create confusion and errors and some other method or procedure seemed desirable.

MEDICAL EXAMINATIONS IN COUNTRIES OF ORIGIN

The Secretary of Labor, under whose direction the Immigration and Naturalization Service then functioned, proposed that consideration be

(From USPHS Records)

Staff of Immigration Hospital, Ellis Island, New York, 1914. Left to right: Drs. Henry A. Knox, James G. Townsend, Grover A. Kempf, John J. Loughran, Walter L. Treadway, Simon P. Brooks, Harry F. White, Robert L. Wilson, Henry C. Cody, Ezra K. Sprague, Eugene H. Mullan, Charles W. Vogel. Seated at desk: Dr. Louis L. Williams, Sr.

(From USPHS Records)

Aliens arriving at Immigration Station, Angel Island, San Francisco, September, 1931.

(From USPHS Records)

Applicant for immigration visa (left) taking intelligence test, American Consulate in Europe, 1950.

given to the possibility of conducting the medical examination of immigrants bound for the United States aboard ship en route. A study of the proposal indicated that the detection of a mandatorially excludable disease or defect aboard ship would render the voyage of such immigrants useless and in no way lessen their hardship or be a substitute for examination at ports of arrival. In 1925 an alternate proposal was suggested by Surgeon General Cumming to the effect that examinations be made of prospective immigrants in their country of origin, preferably at the time of their application for American immigration visas. Consideration was then given to the possibility of a limited and experimental application of Surgeon General Cumming's proposal, preferably in the British Isles. After conferences among the Secretary of Labor James J. Davis, Assistant Secretary of State Wilbur J. Carr, and Surgeon General Cumming in March 1925, it was agreed that a committee should visit the British Isles for the purpose of determining the feasibility of inaugurating such a plan. The membership of that committee included Assistant Secretary of Labor Robe Carl White; Chief Supervisor of the Immigration and Naturalization Service Irving F. Wixen; Consul General Coert du Bois, Chief Visa Control Office, Department of State; and Assistant Surgeon General John W. Kerr of the Public Health Service.

After a study of the local situation, the proposed plan appeared feasible on an experimental trial basis in England and Ireland. Upon recommendation of the Committee, the plan was approved by the State, Treasury, and Labor Departments and the assent of both the British and Irish Free State governments was given for its inauguration.

Doctor Kerr remained in Europe for a time assisting with the development of detailed plans for the actual experiment at several American Consulates in Great Britain and the Irish Free State. Three consulates were chosen in Ireland, three in England, and one in Scotland for this experiment. Early in the summer of 1925, eight medical officers of the Service were assigned to duty at these consulates incident to the medical examination of prospective immigrants applying for American immigration visas, but these were supplemented by additional officers in keeping with the volume of work to be performed.

The medical officers first assigned to Dublin, Cobh, and Belfast, Ireland, included, respectively, Drs. Walter L. Treadway, Lynne A. Fullerton, Floyd C. Turner; to Liverpool, London, and Southampton, England, were detailed respectively, Lon O. Weldon, Paul M. Stewart, and Justin K. Fuller; and at Glasgow, Scotland, Ralph E. Porter. Dr. S. Lewis Christian, assigned to duty at the American Consulate General in London, served as relief medical officer during the inauguration of this work.

The plan proved feasible and practical not only to United States officials, but to those of the British and Irish Free State governments whose nationals, as intending immigrants, were greatly convenienced by it. A plan similar to that of the United States Government was inaugurated in England by the Canadian government the following year.

The success of the plan attracted the attention of other European governments who sought equal cooperation. Following their requests, measures were taken to initiate the plan in connection with the American Consulates at Bremen, Stuttgart, Cologne and Berlin, Germany; at Rotterdam, Holland; at Antwerp, Belgium; at Prague, Czechoslovakia; at Warsaw, Poland; at Bergen and Oslo, Norway; and at Guttenberg and Stockholm, Sweden. Somewhat later the plan was extended to Genoa, Naples, and Palermo, Italy. Headquarters for the supervision of this work were established in Paris, France, under the leadership of Dr. Taliaferro Clark.

Such a plan, while not giving absolute assurance of admission to the United States, if a particular alien were otherwise admissible, nevertheless, in a large measure, prevented the departure from their homeland of immigrants who could not meet the medical and other immigration standards for admission. At long last such a plan not only simplified the administration of the United States immigration laws, but made their administration more humane in character and outlook. To this end the contributions of Public Health Service officers were not insignificant.

POST WORLD WAR II IMMIGRATION

The plan outlined above continued to operate until the entrance of the United States into World War II. Thereafter, for all practical purposes immigration ceased but was again resumed after the cessation of hostilities. With its resumption medical officers and nurses of the Service

were once more assigned to specific American Consulates and ports of embarkation in Western Europe, and to American Consulates in Canada, Cuba, and Mexico. In 1948 such personnel were assigned to duty at Shanghai, China, incident to the examination of displaced persons seeking immigration visas to the United States.

DISPLACED PERSONS PROGRAM

An Interdepartmental Committee on Immigration to the United States of Certain Displaced Persons and Refugees in Europe was established by the President on December 22, 1945. The Planning Committee was comprised of representatives from the Department of State, War Department, Department of Justice, War Shipping Administration, U. S. Public Health Service, and United Nations Relief and Rehabilitation Administration.

On completion of the basic planning in Washington, representatives of the Committee visited Europe to consider the schedule of transatlantic vessels, the location of posts, and appropriate working space for the medical examinations. Plans were made by representatives of the Public Health Service for the required medical personnel and the procurement of necessary medical supplies and equipment to fulfill the responsibilities of the Public Health Service under the provisions of the Displaced Persons Plan.

Members of the Committee who visited Europe early in 1946 to plan and prepare for the inauguration of this Displaced Persons Program were:

Mr. Ugo Carusi, Commissioner of Immigration and Naturalization
Mr. Howard K. Travers, Chief, Visa Division, Department of State
Dr. Gilbert L. Dunnahoo, U. S. Public Health Service
Lieutenant Colonel William R. Buster, General Staff, U. S. Army
Colonel Frank F. Balke, European Theater of Operations, U. S. Army

During the two year period ended June 30, 1950, approximately 200,000 persons were admitted to the United States under the Displaced Persons Act of 1948 and its amendments.

IMMIGRATION AND MENTAL HYGIENE

The functions of the Public Health Service in connection with the Immigration and Naturalization Service are solely in an advisory capaci-

ty. Medical officers certify to the presence of disease, defects, and disabilities among arriving aliens and among those applying for American immigration visas. They administer the medical problems incident to immigration for the Immigration and Naturalization Service and render medical testimony incident to the enforcement of the immigration laws by the Immigration and Naturalization Service.

The psychiatric services and activities at Ellis Island played an important part in the subsequent history and development of the present-day mental health interests and program of the Public Health Service.

The national significance of foreign immigration, particularly the influx of aliens during the first two decades of the present century and the mental health implications associated with it, helped to bring about a greater awareness that mental diseases and defects constituted a national health problem. During the period 1880-1921, 44.8 percent of all first admissions to State and private mental hospitals in New York State were foreign-born persons. During the 22-year period from 1900 to 1921, inclusive, the foreign-born comprised 46.6 percent. In the general population, the foreign-born comprised 15 percent in 1900, 16 percent in 1910, and 14.5 percent in 1920.

This awareness found expression on the part of the leadership of the Public Health Service in the inauguration of Field Studies of Mental Hygiene by the Service, in the creation of a Division of Mental Hygiene, and subsequently culminating in the National Mental Health Act of 1946 and the establishment of the National Institute of Mental Health.

(From USPHS Records)

Dr. James C. Perry, who established the maritime quarantine service in the Philippine Islands in 1900.

(From USPHS Records)

U. S. Quarantine Station, on the Mississippi River, New Orleans (Algiers), Louisiana, 1950.

CHAPTER III

The Evolution of Public Health

Good reasons must, of force, give place to better.—WILLIAM SHAKESPEARE

Control of Disease in the Colonies

TOWNS AND COMMUNITIES of the American colonies from time to time, as occasion required, utilized the power of quarantine to prevent the introduction of communicable disease. For a considerable period, this power was used almost entirely to prevent the importation of disease by ships. The first group action for the exclusion of contagious disease by land quarantine is found in the Town Records of East Hampton, Long Island, under date of March 2, 1662. It reads as follows:

> It is ordered that no Indian shall come to towne into the street after sufficient notice upon penalty of 5s. or be whipped until they be free of the smallpoxe; but that they may come where they have come on the back side and call: and if any English or Indian servant shall go to their wigwams they shall suffer the same punishment.

The Salem selectmen in Massachusetts Bay Colony passed their first ordinance, designed to prevent the spread of disease, in 1678, as follows:

> It is ordered that William Stacy who is sick of the small pox doeth not presume to come abroad until three weeks after this date be expired and that he be very careful yt when yt time be expired he shift his clothes and doe not frequent any company till he be wholly cure of that infection.

Governor Clinton of New York in 1793 issued a proclamation regarding the epidemic of yellow fever then present in the city.

Local and State Health Authorities

The first State health department was established in Massachusetts in 1869. The foundation was laid for arousing interest in the promotion of sanitation and the prevention of disease by Lemuel Shattuck and others when he published in 1850, *The Report of the Sanitary Commission of Massachusetts.* The State of Louisiana had a State-wide quarantine board in 1855.

A health department was established for the District of Columbia in 1870; California and Virginia both established State health departments in 1871. Establishment of health departments by other States progressed gradually. Epidemics of smallpox and yellow fever, particularly in the southern States, were a definite stimulus for the inauguration of State health work, coverage of the United States being completed in 1909 when New Mexico established its health department.

In approving the Constitution of the United States, the States reserved to themselves certain police powers, which included autonomy in health matters. Therefore, within a State, the police power of that State is the controlling authority in such matters. For this reason, it is difficult, for persons not familiar with the rights of individuals and States and our form of government under the Constitution, to understand how the local, State, and Federal governments function satisfactorily together. Yet, through the years, these three authorities have successfully and effectively performed their respective functions. This applies in the field of public health as well as in other areas of government activities.

The occurrence of yellow fever, smallpox, cholera, typhoid fever, or similar outbreaks, caused States or local communities to cast about for some means of preventing the recurrence of such epidemics.

It is said that a board of health was established in Petersburg, Virginia, in 1780, and one was certainly established in Philadelphia in 1794 and one in New York City in 1796. The first comprehensive State enactment providing for the establishment of a local board of health was that of June 22, 1798, in Massachusetts. Under this authority, Boston established a board of health in 1799, with Paul Revere at its head.

A report of the American Public Health Association in 1873 states that only five local boards of health were established between 1800 and 1830. The records indicate that 32 local boards of health were established between 1870 and 1873.

Epidemics

Beginning about 1871, prior to the development of State health departments in many States and, in the absence of local health personnel, it became customary when an extensive outbreak of disease occurred

for a State to request assistance of the Federal government. From the time of the reorganization of the Service in 1871, Surgeon General John M. Woodworth contemplated that the Marine Hospital Service would become in fact a national health service. During the period from 1873 to 1905 the Marine Hospital Service assisted States or wholly controlled the work of suppressing epidemics of yellow fever in the United States.

CHOLERA IN THE MISSISSIPPI VALLEY

In 1873 there was an outbreak of cholera in the Mississippi Valley. This epidemic began in New Orleans, was carried up the Mississippi River with the river traffic, and was most widespread in Louisiana, Tennessee, Kentucky, Missouri, Ohio, and Illinois. A joint resolution of Congress, approved by the President on March 25, 1874, ordered that a medical officer of the Army, in conjunction with the Supervising Surgeon of the Marine Hospital Service, should ascertain the facts of this epidemic and "make detailed report of the information collected on or before the first day of January 1875, to the President to be submitted to Congress."

YELLOW FEVER IN THE SOUTH AND MIDWEST, 1878

In the present day it is all but impossible for us to understand the terror that descended upon a community with the appearance of the dreaded yellow fever. The following typical incidents described by Geddes Smith in *Plague on Us* illustrate the devastation that yellow fever brought to affected communities.

During the summer of 1878 a terrible epidemic of yellow fever visited the South and Midwest. Newspapers on July 24 of that year carried a small note reporting four deaths in 48 hours from yellow fever in New Orleans. Four days later the news went out that Mobile had established a rigid quarantine against New Orleans.

On August 11, under a Memphis dateline, the death from yellow fever of six persons at Grenada, Mississippi, was recorded. As the cases and deaths increased, news of the epidemic reached the front page of the newspapers of the major cities. The story of Grenada, Mississippi, received special attention because of the daily dispatches sent by the town's telegrapher. The first cases of sickness appearing in the little town were dismissed as "bilious fever." The local board of health on August 11 reluctantly admitted the presence of an epidemic. Three days later all but 700 of the 2,200 white inhabitants had fled. Only the undertakers' shops and drugstores were

open. With windows closed, trains went through the village without slackening speed. Except for physicians and nurses from Memphis and New Orleans, the town was cut off from the world. On August 15 there were 300 white people left, half of whom were sick. Two days later there were 200 and only 30 or 40 of these persons were well. The telegrapher in writing his story said, "Surely the end cannot be far and the chapter must soon be closed." A few days later he recorded that "No one had dared to enter the town for several days. When we are gone, God only knows what will become of the stricken."

On the 22nd of August, word reached the village that the War Department was sending tents for refugees but the question was who would put them up. "There are not 20 active men in town." The telegrapher indicated that there was one corpse and four sick persons in the house where he lived. The dispatches from the telegrapher grew more brief. On August 29, there was little more than a list of the recent dead, 22 in 24 hours, and the telegrapher signed off with the despairing statement, "In spite of all the doctors can do, death seems to reign supreme." Two days later, he too was dead. The story is still told in Grenada that he died at his telegraph key.

While this epidemic was gathering force in New Orleans, a new towboat, the *John D. Porter,* put out from that port with a string of barges for Pittsburgh. As this towboat slowly steamed up the river, she came to symbolize for newspaper readers the threat of yellow fever. At Vicksburg she put back to bury an engineer and a fireman and took on a substitute engineer. At Memphis she was already marked in the public mind as a fever ship and barred from the docks. Beyond Cairo the substitute engineer left the boat and found his way home to die. At Cincinnati, after four deaths which everyone but the ship's officers ascribed to yellow fever, she was boarded by two physicians of the Marine Hospital Service who stayed with her to care for the sick. Near Gallipolis, Ohio, the fever-ridden crew refused to go farther. All who could do so went ashore and, brushing aside the guards set up by the village, carried death to 31 local citizens. When the boat finally reached her destination, it is recorded that 23 men had died on board and she had "distributed poison through a journey of more than 1,000 miles."

While New Orleans, Vicksburg, and Memphis suffered more severely in this outbreak, nearly 100 cities and villages felt the effect of yellow fever. Refugees crowded the trains to the north. Travel between cities in that area was paralyzed, and innumerable local quarantines were enforced, often at the point of a shotgun, so-called "shotgun quarantine."

This is part of the story of the great epidemic of yellow fever that swept up the Mississippi in 1878. It exacted a toll of more than 100,000 victims, 20,000 of whom died under the eyes of physicians, and State and local boards of health, despite their earnest efforts.

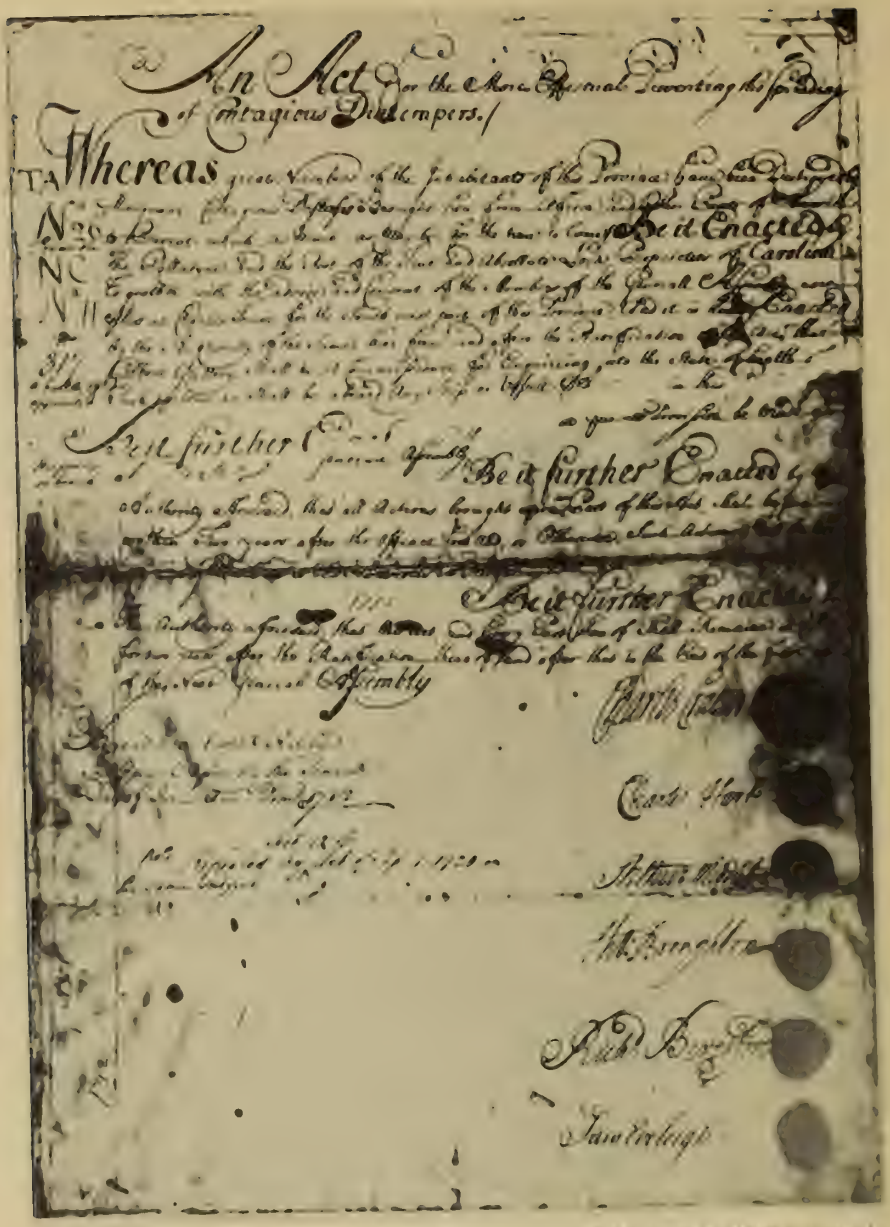
Dr. Roswell Waldo of the Marine Hospital Service died at Cairo, Illinois, on October 18, 1878, of yellow fever contracted while he was

(From USPHS Records)

Camp E. A. Perry, yellow fever detention camp conducted by the U. S. Marine Hospital Service, near line between Georgia and Florida, 1888. Persons leaving Florida because of yellow fever were required to remain in this camp for the incubation period (six days).

(From USPHS Records)

U. S. Postal Car, mail, passengers, and box cars at mail fumigation station. These disinfecting stations were conducted by the U. S. Marine Hospital Service at the request of the State authorities during yellow fever epidemics in the South, about 1880-1900.


An Act for the more effectual preventing the spreading of Contagious Distempers.

Whereas

Be it Enacted

Be it further Enacted

Be it further Enacted

(From *Government in Public Health* by Harry S. Mustard. New York, The Commonwealth Fund, 1945)

An Act by the General Assembly of the Province of Carolina, June 7, 1712, "for the more effectual preventing the spreading of contagious distempers" and the appointment of a health officer.

carrying out his duties as an officer of the Marine Hospital Service at that port.

In response to the urgent requests from State or local authorities, Surgeon General Woodworth assigned medical officers from the Marine Hospitals to work with the local communities during outbreaks of yellow fever, cholera, or smallpox. In this way was laid the foundation for later programs of cooperation with, and assistance to, States in many public health problems.

YELLOW FEVER AT FRANKLIN, LOUISIANA, 1898

As an illustration of the work of the Marine Hospital Service in cooperating with State and local health authorities during outbreaks of yellow fever, a brief summary of operations at Franklin, Louisiana, during an outbreak in 1898 is of interest.

On August 11, 1898, a report reached Surgeon General Wyman that a death from yellow fever had occurred at Franklin, Louisiana. Dr. Henry R. Carter then at New Orleans, Louisiana, was directed to investigate this at once. During the epidemic in 1897 there had been three reported cases and one death at Franklin. The following day Doctor Carter reported that the diagnosis was correct, that it was yellow fever. Doctor Carter was instructed to arrange all details for the establishment of a detention camp and temporary hospital and to perfect necessary arrangements for the inauguration of train inspection service and make such other preparations as would be needed. Dr. Parker C. Kalloch was placed in immediate charge under the general direction of Doctor Carter.

Dr. Rudolph H. von Ezdorf, Dr. Charles J. Faget, son of Dr. Jean Charles Faget, who described "Faget's Sign" in yellow fever, and Dr. Percy Ahrons were assigned to duty at Franklin. Mr. Edwin J. Thurston and Mr. Benjamin E. Holsendorf, both career pharmacists of the Service, were also sent there. They conducted fumigations, made inspections, and handled administrative matters for the temporary hospital as necessary. Misses Bullard, Ferguson and Norsdorff were the nurses at the temporary hospital. A total of 607 cases of yellow fever occurred between August 11 and October 20, the dates of the first and last cases reported; there were nine deaths. The first killing frost in New Orleans

that year was October 27, which meant the end of the epidemic in that State.

LAST YELLOW FEVER EPIDEMIC IN THE UNITED STATES

The last outbreak of yellow fever in the United States occurred at New Orleans in 1905. As early as July 18 of that year rumors were afloat that yellow fever was present in New Orleans. These rumors spread to adjoining States where the health authorities began to make inquiry of the Public Health and Marine Hospital Service. Dr. Joseph H. White, then on duty at the Marine Hospital, Mobile, Alabama, at the request of Dr. Rhett Goode, City Health Officer of Mobile, went to New Orleans for the purpose of investigating the matter and of consulting with State and local health authorities. The first cases appear to have occurred on July 12. The Governor of Louisiana, in a telegram to President Theodore Roosevelt, dated August 4, 1905, requested the assistance of the Service in handling this outbreak. The President promptly instructed Surgeon General Wyman to take action to meet the situation. Doctor White was directed to assume charge of the epidemic control operations. Twenty-four medical officers, two of whom were especially trained in laboratory work, were ordered by telegram to report to him for duty. Twenty-eight local physicians were employed on a temporary basis. There was complete cooperation on the part of State and city health authorities. Doctor White immediately organized a campaign for the control of mosquitoes through screening, fumigating, oiling and salting, as well as isolation of the sick. The outbreak was brought under control and the epidemic declared to be terminated on October 26, 1905. This was before the first frost of the season. The first killing frost that year in New Orleans was on December 3. For many years, the first killing frost had been considered to be the factor that terminated an epidemic. In New Orleans, with a population then of 325,000, a total of 3,404 persons developed yellow fever and 452 of them died during this outbreak.

There were sporadic outbreaks of yellow fever in other parts of the South during that year. Officers of the Service were assigned to those areas to work with State and local authorities. The epidemic in New Orleans afforded for the first time an opportunity within the United States to put into effect in an extensive outbreak the principles of control

based upon the proven thesis that yellow fever was transmitted by the bite of the *Aedes aegypti* mosquito. This was demonstrated by Dr. Walter Reed of the United States Army working with Dr. James Carroll, Dr. Jesse W. Lazear, and Dr. Aristides Agramonte. Dr. Carlos Finlay of Cuba had put forward this thesis as early as 1881. The work of Dr. Henry R. Carter of the Service, a graduate in both engineering and medicine, who demonstrated in 1898 the extrinsic incubation period of yellow fever (the time required to develop the disease in some outside host), was of material assistance in the expansion of our knowledge regarding the disease and of control measures. According to Doctor Carter and other authorities, yellow fever made its appearance in the western hemisphere as early as 1648, occurring as a severe epidemic in that year in Yucatan and in Havana, Cuba.

The years in which outbreaks of yellow fever have occurred in seaboard cities of what is now the United States for the period 1668-1893 are recorded in an interesting table in the Annual Report of the Marine Hospital Service for 1895, pages 428-439. This table arranged in chronological sequence shows the supposed source of infection, also the number of deaths in many of the epidemics.

ORIGIN OF YELLOW FEVER IN THE WESTERN HEMISPHERE

Shortly after his retirement in 1922, Dr. Henry R. Carter undertook the writing of a history of yellow fever. At his death in 1925, the manuscript for this history had been fully drafted; however, none of it had undergone final revision. The editing of this draft was undertaken by Dr. Wade H. Frost of the Service, assisted by Doctor Carter's daughter, Miss Laura Carter. This book, *The Early History of Yellow Fever,* published in 1931, concluded that yellow fever was brought to this hemisphere from Africa. It was Doctor Carter's opinion that the first record of direct observation of yellow fever occurred in the western hemisphere in Yucatan in 1648. To emphasize this he pointed out that there were unusually full records by the Spaniards covering 120 years from the time of the beginning of the occupation until 1648, and in them he found no indications whatsoever of yellow fever.

Some writers are inclined to accept the view that yellow fever occurred in Haiti as early as 1495. Doctor Carter contends that his examination of the contemporary accounts shows no evidence for that belief.

Doctor Carter did not intend to imply that 1648 is the date of the first occurrence of yellow fever anywhere in the Americas. He felt that although in all probability it had occurred before that date in various places, its dissemination was limited at first by the restricted distribution of the insect vector. Repeated introductions into a place where the area of *Aedes aegypti* infestation was gradually extending might cause a series of small epidemics and eventual permanent establishment without any one sweeping epidemic such as occurred in Yucatan and Cuba in 1648.

It was Doctor Carter's view that the early history of western Africa is not so thoroughly negative as that of America. He felt that the sickness in Drake's expedition of 1585, and that of Van der Does in 1599, and of Mascarhenas in 1638, although not certainly showing yellow fever in western Africa, are indicative of it. Doctor Carter concluded that—

> The biological evidence, as regards both the insect vector and the human host, is, so far as it goes, altogether in favor of an Old World—hence African—origin of yellow fever, and this, we find, is entirely consistent with the historical evidence. If, by itself, neither kind of evidence, biological or historical, is altogether conclusive, we think that together it makes a very strong statement.

Before World War II it was shown, chiefly by workers of the Rockefeller Foundation, that yellow fever is caused by a virus, and that there are two epidemiological patterns of the disease; these are known as urban yellow fever (man-mosquito-man cycle) and jungle or forest yellow fever (monkey-mosquito-monkey cycle). In the latter form the monkey, and perhaps some other animals of the tropical forests, serve as reservoirs for the virus, and man is accidentally infected by sylvan mosquitoes when he enters the forests. The urban and jungle forms of this disease occur in South America and in Africa. The jungle type also occurs in Panama of Central America.

Within the recent past (1947-1950) minor outbreaks of yellow fever have occurred in limited areas in Central and South America. These cases were confined largely to persons who lived near or worked in the jungles.

Bubonic Plague Reaches the United States

Bubonic plague was first recognized on the North American continent in 1900 at San Francisco when the body of a Chinese, dead of the disease, was found in the Chinese quarter of that city on March 6. The disease was proved bacteriologically to be bubonic plague. The bacterial diagnosis of this case of plague was the brilliant work of Dr. Wilfred H. Kellogg, an able young bacteriologist of the City Board of Health, who later became Director of the Bureau of Communicable Diseases of the State Board of Health and then State Health Officer from 1918 to 1920. Other persons having the disease were discovered from time to time until by February 1904 the total reached 121 of whom 113 had died.

Plague had appeared in Honolulu in December 1899; therefore, officers of the Marine Hospital Service on duty at the Quarantine Station at San Francisco had been on the alert for some time for plague vessels reaching that port from Honolulu or the Orient. Dr. Joseph J. Kinyoun was in charge of the U. S. Quarantine Station at San Francisco in 1900. He was eminently fitted for this important duty. Several years earlier he had spent some time working with Pasteur in the laboratory in Paris. He had been the first Director of the Hygienic Laboratory, now known as the National Institutes of Health. Doctor Kinyoun was especially trained in bacteriology and was qualified to conduct the bacteriologic examinations necessary to identify the presence of bubonic plague in that port and to support the local health authorities in the controversy that was to follow.

CONTROVERSY BEGINS

The City Board of Health, upon confirming the diagnosis of the first case of bubonic plague in 1900, placed the entire Chinatown district of San Francisco, comprising about 12 city blocks, in quarantine, the quarters being roped off and police placed on guard. This action by the San Francisco Board of Health, and the confirmation of Doctor Kellogg's diagnosis by Doctor Kinyoun of the Service, initiated a series of dramatic medico-political events that now, from the distance of 50 years, seem unbelievable and fantastic. All the newspapers of the city except one took opportunity to attack the Mayor who had just entered

office. A campaign of vilification was launched against the City Board of Health and Doctor Kinyoun and his staff. This campaign, for unexampled bitterness, unfairness, and dishonest methods, according to Dr. Wilfred H. Kellogg who at that time was bacteriologist for the City Board of Health, probably never had been equalled. The campaign of denial of the presence of plague and resistance to the City Board of Health became a political issue of the most violent character and the matter even reached the courts of law. The controversy involved health officers and boards of health of the city and State, as well as officers of the Marine Hospital Service. Medical practitioners of San Francisco also took sides. The Governor of the State made it a political issue and made the Marine Hospital Service, the Secretary of State, and the Secretary of the Treasury targets for violent criticism and abuse.

The Chinese colony in San Francisco at that time numbered about 20,000 and included many wealthy organizations and individuals. The Chinese are great litigants and always employ the best available legal talent. Every device was utilized by the Chinese organizations in San Francisco to throw legal obstacles in the way of the requirements of the Marine Hospital Service in connection with quarantine activities against plague in that port.

The courageous members and officials of the City Board of Health were subjected to the continuous campaign of vilification. They were attacked by editors, mayors, governors, judges of the Federal courts, and by their fellow citizens and were designated as the "perpetrators of the greatest crime that has ever been committed against the city." They were men of sterling integrity who had the courage of their convictions and stood fast against the most virulent combination of falsehood and personal attack that probably ever was endured by any local health department before or since.

As noted above, Doctor Kinyoun was included in this cloud of suspicion, distrust, and positive hate that was almost universal in the community. Dr. Joseph H. White was sent from Washington in December, 1900, to investigate the situation. In January 1901, he recommended a study of the problem by a special commission.

PLAGUE LABORATORY

Early in 1901, a Plague Laboratory was established in the Chinatown area. Prior to this, and from March 1900 until the spring of 1901, plague-suspected tissues were examined by Doctor Kinyoun at the laboratory of the Quarantine Station on Angel Island in San Francisco Bay. Upon the establishment of the Plague Laboratory in the Chinatown area, Dr. J. M. Flint, an experienced bacteriologist from the University of Chicago, was placed in charge, assisted by Dr. Donald H. Currie of the Marine Hospital Service. Doctor Flint departed after several weeks leaving the work in the hands of Doctor Currie, who remained at the laboratory until its discontinuance in April 1905. At various times, Dr. Mark J. White and Dr. Bolivar J. Lloyd also served in the laboratory in examining plague-suspected tissues, performing postmortem examinations, and in the examination of rats from the Chinatown section.

In the recrudescence of plague in 1907, the laboratory was reestablished in the center of the city, and Dr. Halstead A. Stansfield was placed in charge of the work in September 1907. Drs. W. B. Wherry and A. A. O'Neil were also on duty at the laboratory for a time. Doctor Stansfield resigned from the Service early in 1908 and was succeeded by Dr. George W. McCoy in March 1908. Later on Dr. Carroll Fox was assigned to this laboratory for the specific purpose of studying fleas. Still later Dr. Charles W. Chapin was assigned to the Plague Laboratory, and there while working with Dr. George W. McCoy the causative organism of the disease now known as tularemia was first isolated and identified.

The Indian Plague Commission report made in 1905 implicated the *Xenopsylla cheopis* flea as the means of transmitting plague. When the outbreak of plague occurred in San Francisco in 1907, the Public Health and Marine Hospital Service in Washington took steps to have fleas collected at other ports along the Pacific Coast and the Gulf of Mexico in order to secure information as to the prevalence of the *Xenopsylla cheopis* in the ports of the United States and their relation to the occurrence of plague. It was necessary for the Service to send the first of these fleas to a consultant, who was a physician and an entomologist, Dr. Leland O. Howard of the Bureau of Entomology of the Department of Agriculture,

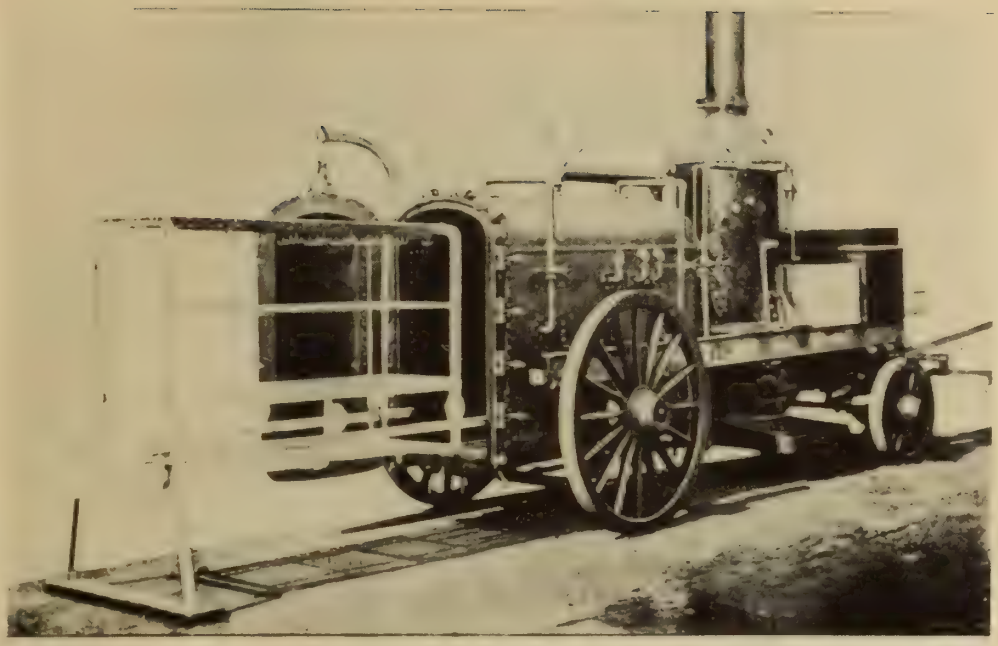
for identification until the Division of Zoology of the Hygienic Laboratory acquired proficiency in the identification of fleas.

SPECIAL PLAGUE COMMISSION

In accordance with Doctor White's recommendation and because of the weight of the powerful political attack against Doctor Kinyoun, Surgeon General Wyman engaged the services of a special commission consisting of Dr. Frederick G. Novy, University of Michigan; Dr. Llewellys F. Barker, University of Chicago; and Dr. Simon Flexner, University of Pennsylvania. Upon the arrival of this commission in San Francisco late in January 1901, the Governor of the State wired a protest to the President. The Secretary of the Treasury informed the Governor that the commission should make its investigations in its own way, "unhampered by detailed instructions from the Public Health and Marine Hospital Service or any other influence." The special commission was fortunate in observing six cases of plague within a few days. Their report was submitted on February 28, 1901. It confirmed the existence of bubonic plague in San Francisco and settled the matter even in the minds of those physicians who before then had been skeptical about the findings of the local board of health and of Doctor Kinyoun. On February 25, 1901, the Governor requested the Federal government to assume charge of all plague control work. Prior to this action by the Governor, a conference of State health officers made it very clear to representatives of California that drastic action would be taken by all States unless control measures were initiated. The emphasis of the early plague control in San Francisco was on fumigation and sterilization of the premises, and fumigation of outgoing ships. These measures were under the direction of Dr. Joseph H. White from January 1901 until June 1901.

PLAGUE WORK BY FEDERAL GOVERNMENT

From March 1900 until June 1900, control work was carried on by the U. S. Marine Hospital Service through quarantine measures including fumigation and disinfection of shipping in the San Francisco harbor and by train inspection at border points. From June 1900 until February 1901 all preventive measures were in abeyance on orders from Washington, D. C. The San Francisco Department of Health directed control



(From USPHS Records)

Portable steam disinfector, Kinyoun-Francis pattern, 1894, used during yellow fever epidemics.

(From USPHS Records)

Yellow fever hospital, Franklin, Louisiana, 1898, operated by the U. S. Marine Hospital Service.

(From USPHS Records)

Nurses at yellow fever hospital, Franklin, Louisiana, 1898: Misses Bullard, Ferguson, and Norsdoff.

(From USPHS Records)

Fumigation of houses for destruction of mosquitoes. Yellow fever campaign, New Orleans, 1905.

measures against the Chinatown area alone through fumigation of premises, disinfection of buildings and streets alike and by a cordon placed around Chinatown for a while. This latter was suspended by a court injunction.

Throughout this period, Doctor Kinyoun was in charge of Service activities in the San Francisco area. Subsequent to the report of the special plague commission, the Marine Hospital Service, at the request of the State and city authorities, assumed charge of the control work in February 1901. The role of the flea in the transmission of bubonic plague was not then known and efforts were confined to fumigation, disinfection, and attempted immunization of the human population by Haffkine vaccine and restriction of travel from Chinatown.

From January 1901 until June 1901, Dr. Joseph H. White was in charge followed successively by Dr. Rupert Blue, Dr. Mark J. White, and Dr. Arthur H. Glennan. In May 1903, Doctor Blue was returned in charge and continued until Service work was suspended in April 1905, on the assumption that infection had been eradicated—a mistake, as the recurrence of cases in 1907 proved.

RECRUDESCENCE OF PLAGUE IN SAN FRANCISCO

In May 1907, a year after the great earthquake and fire in San Francisco, bubonic plague was again discovered in that city. Fortunately, the citizens of San Francisco, including the politicians, the press, and the physicians, remembered the object lesson of the first epidemic and, as a result, Surgeon General Wyman was requested again to assign Dr. Rupert Blue to take charge of the plague control measures within the city. He was given the unanimous support of all interested persons and organizations and carried on the work of control of the outbreak under very favorable conditions.

An important factor in the change of attitude among the politicians was the fact that the people of San Francisco came to realize the importance of the work done by the Public Health and Marine Hospital Service in controlling the first outbreak of plague in that city. A medical officer of the Service, Dr. Justin K. Fuller, recalls that he was an early teen-ager attending school in San Francisco at that time. He remembers vividly the turmoil occasioned by the controversy regarding the presence of plague there. He states that the ratproofing program conducted by

the Service during the second epidemic was by no means limited to the public buildings on the waterfront, but that it extended into the residential districts and even to the house in which he lived as a youngster. He recalls clearly that among other things this program included the purchase of new garbage cans and intensified sanitary consciousness. There was a deep appreciation in the minds of the general public of the efforts made by the Service and the local health department to control the second outbreak of plague, and the name of Dr. Rupert Blue came to be a household word that was regarded almost with reverence.

The second outbreak lasted six months; the total number of cases of plague was 160, with 77 deaths. A banquet celebrating the victory over plague was held in one of the main streets of the city to emphasize that San Francisco was now so clean that one could eat a meal in the street.

PLAGUE IN OTHER CITIES

During 1907, seven cases of plague appeared in Seattle, Washington. Measures were promptly undertaken there by the Public Health and Marine Hospital Service, in cooperation with State and local authorities, and the incipient outbreak was brought under control.

The control of an outbreak of human plague in Los Angeles in 1908 is an example of an instance where prompt and effective action by a local health official probably averted a serious outbreak. A single case of human plague was traced to the handling of a sick squirrel which apparently had become infected from rats brought in from a rural plague area on grain cars. Dr. Luther M. Powers, the City Health Officer, directed a vigorous anti-squirrel campaign in the area and secured the services of Dr. Arthur M. Stimson from the Public Health and Marine Hospital Service, who made laboratory examinations of some 25,000 rats and squirrels over a period of eight months. No further instances of infection were discovered.

PLAGUE INFECTION IN GROUND SQUIRRELS

Extension of plague infection to the ground squirrel population of the rural territory adjacent to San Francisco was first demonstrated in August 1908. As early as 1903, it was suspected that the infection had been carried from rats to ground squirrels during the first epidemic in

1900-1904. The ground squirrels of California, especially in the San Francisco area, probably became infected shortly after the appearance of plague in that port. A campaign of killing ground squirrels to obtain information on the presence of plague infection in these rodents in rural areas around San Francisco and other areas of California was undertaken by Doctor Blue in February 1909. Since that time surveys have been extended to 611 counties in 17 States. Plague infection has been found in rodents in 137 counties of 15 of these States.

The spread of plague infection among rodents, especially ground squirrels, from California to other areas of the country has been gradual. The infection in rodents had been reported as far east as Thomas County, Kansas, in 1949, with no further advances by mid 1950.

The appearance of bubonic plague on the West Coast brought to this continent the fifth great pestilential disease. Smallpox was known in the early colonial days, yellow fever made its appearance as early as 1721, and cholera was known to have occurred as early as 1833. Typhus fever repeatedly appeared in epidemic form in eastern cities of the United States in the early and middle nineteenth century. With the transmission of plague from the Orient in 1900, an infection was introduced which has constituted a continuing problem of concern to public health authorities to the present day (1950).

PLAGUE IN PUERTO RICO

The next appearance of bubonic plague in territory under the control of the United States was at San Juan, Puerto Rico, on June 19, 1912. In response to a request from the insular authorities, the Service assigned Dr. Richard H. Creel to undertake control measures in the Island. He was assisted by Dr. Charles L. Williams, Sr., Dr. Joseph R. Ridlon, and, toward the end of the campaign, Dr. Charles W. Chapin reported for duty. It was here that a ratproofing law with standard requirements was first formulated by Doctor Creel. While it was based on lessons learned in the San Francisco campaign in 1907-08 and incorporated the general principles of the San Francisco enactment, the latter had no standards as to the degree of "elevation" nor were concrete floors protected by side walls nor was the quality of materials specified.

It is noteworthy that rodent infection extended to Caguas, 23 miles from San Juan, and to Arecibo, 50 miles distant. All evidence pointed to the transit of infected rats in railroad freight. The foci were promptly eradicated and no human cases resulted.

On September 13, just 86 days after the official announcement of the presence of plague, the last plague infection was reported. Plague recurred in February 1921 with 25 cases in 10 communities, and 90 positive rats in nine communities. The last human case occurred on August 30, 1921. The last positive rat was found on September 8, 1921. This outbreak of plague was handled entirely by the Insular Department of Health.

PLAGUE APPEARS IN NEW ORLEANS

In June 1914, plague was recognized in New Orleans. State and city authorities immediately requested the Public Health Service to take over the control operations. Dr. W. Colby Rucker, at the direction of Surgeon General Blue, assumed charge of the control measures for several months. Upon the departure of Doctor Rucker to return to Washington, Dr. Richard H. Creel was placed in charge. Full plague control operations in New Orleans continued until 1916 when the city was declared to be free of infection. Measures against plague were continued for a time on a modified basis. Thirty-one cases and nine deaths occurred during the two-year period. In October 1919, plague again appeared in New Orleans. Dr. Marion S. Lombard was in charge of plague operations, and Dr. Charles L. Williams, Sr., was in charge of the laboratory during this outbreak. The city was declared free of plague on June 23, 1920. Twenty cases and a total of 18 deaths occurred during the second outbreak in New Orleans.

PLAGUE APPEARS IN OTHER PORTS

In Oakland, California, a series of 14 cases of pneumonic plague appeared in 1919 with 13 deaths. The first was recognized on August 15, the last death was on September 11. There was no further extension of this outbreak of pneumonic plague.

Plague was reported in Pensacola, Florida, on May 31, 1920. Dr. Roscoe R. Spencer, then in Mobile, Alabama, conducting a rodent

(From USPHS Records)

Photograph taken when Governor Newton C. Blanchard of Louisiana presented his thanks to the officers of the Public Health and Marine Hospital Service who participated in the epidemic of yellow fever in New Orleans, 1905.

1st ROW (left to right): Drs. Charles H. Gardner, John W. Amesse, Joseph H. White, Governor Newton C. Blanchard of Louisiana, Drs. Rupert Blue, John McMullen, Donald H. Currie. 2nd ROW: Drs. W. Colby Rucker, Harvey G. Ebert, Gustav M. Corput, Joseph Goldberger, Thomas B. Richardson, Thomas B. Berry, Hugh de Valin, Francis A. Ashford, Francis H. McKeon. 3rd ROW: Drs. Edward M. Steger, Marshall C. Guthrie, Wade H. Frost.

(From USPHS Records)

Foreman and squad of rattrappers, with equipment, plague campaign, New Orleans, Louisiana, 1914.

(From USPHS Records)

Elevation of building to eliminate rat harborages, bubonic plague campaign, New Orleans, Louisiana, 1914.

survey, was sent to Pensacola to take charge of control operations. Ten persons developed the disease, the last one on August 31, and seven of them died. The control work was discontinued on August 15, 1921.

A case of human plague was reported in Galveston, Texas, on June 16, 1920. The eighteenth and last case occurred on November 11, 1920. Twelve of these cases were fatal. The early program of control was directed by Dr. J. Holmes Smith and later by Dr. William F. Fox. The last infected rat was found December 2, 1920. The control program continued until October 15, 1922, with Dr. Harry F. White in charge during the latter phases.

In Beaumont, Texas, the first case of plague was reported on June 19, 1920. The fourteenth and last case was reported on August 23, 1920. Six of the patients died. Dr. Harry F. White directed the control operations for that area, including Port Arthur, until the work was terminated on June 15, 1921. Dr. Charles W. Chapin was in charge of the laboratory.

CALIFORNIA AGAIN

In 1924, plague again appeared in Los Angeles. On October 28, with knowledge of two previous cases, 15 additional persons in one area in Los Angeles, were found to have the disease. On October 29, seven cases were reported, three more on October 30, and one additional each day for the next four days. Several of these patients had the pneumonic type of the disease. The campaign in Los Angeles was under the direction of the California State Board of Health from November 6, 1924, until June 3, 1925, with some assistance from the Public Health Service. The City Health Department of Los Angeles took over the work on June 3, 1925. On June 16, 1925, the Public Health Service was requested to take charge. Dr. Rupert Blue assumed control of the work. The participation of the Service was discontinued on July 1, 1926, and the City Health Department continued the control operations on a modified scale.

In a period of about 19 months this outbreak cost the people of Los Angeles about $4,000,000 of which $3,000,000 was for ratproofing buildings and $1,000,000 for other control operations. Measured only in statistical terms of cases and deaths, such an outbreak may seem to the

uninitiated not to be a major public health problem. However, when one considers the latent danger of interstate spread in thickly populated communities with accompanying illness or loss of life, and the amount of money required for control, plague certainly qualifies to be classed as a major health matter.

Plague infection occurred in rats in Oakland in 1924 and resulted in control work carried out by the Service over a period of one year. No human cases occurred.

NEW ORLEANS

Dr. John McMullen was in charge of the work in New Orleans in 1924. His principal assistant was Dr. Charles V. Aiken. In this outbreak 12 plague-infected rats were found in New Orleans, but no human cases were recognized. Dr. Charles L. Williams, Sr. was in charge of the plague laboratory in New Orleans from July 1923 to July 1925.

TACOMA

An outbreak of plague occurred at Tacoma, Washington, in 1942 and lasted through 1944. A total of 109 rats and three wild rodents were positive for plague infection. This outbreak is notable for the fact that it represents the most extensive local domestic rodent epizootic which this country has ever experienced without the occurrence of human cases. This epizootic lasted for two years, those in New Orleans, Louisiana, and Oakland, California, each extended over a period of about one year.

CHANGE IN QUARANTINE EMPHASIS

Thus it is seen why the emphasis of the quarantine activities of the Service was deflected after 1905 from protection against yellow fever to protection against bubonic plague. The possibility of the importation of mosquitoes by aircraft from endemic areas of yellow fever in South America must always be kept in mind. Of even more concern is the possibility of introducing into the United States new species of insects that may be the vectors of disease already present or that may be introduced into this country. Plague continues to this day to be the major threat of a pestilential disease that might be imported into the United

States or reach the rat population of populous communities through spread from infected wild rodents in the United States.

PLAGUE CONTROL METHODS

Sound measures for the control of bubonic plague were not developed until 1907, at which time the mechanism of the transfer of infection by the flea was recognized and generally accepted. In 1903, it was known that rats were the primary source of infection, but it was assumed that the transfer occurred through the contamination of materials and food by the excrement of rats and, accordingly, efforts were confined almost exclusively to disinfection of premises and the destruction of rats. The trapping and examination of rats was first initiated in San Francisco in 1903. In 1905, the Indian Plague Commission found the rat flea to be the infective agent. This Commission also established the important facts that bubonic plague is primarily a disease of rodents, transported by the rat host and transmitted by the flea, and that the disease is rarely conveyed in any other manner; that there is a seasonal increase in fleas and that this condition is followed by an increase in rodent plague; that at a temperature above 85°F. fleas cease to multiply, and that the infective microorganism disappears from their bodies.

Vast epidemics of bubonic plague, then known as the "Black Death," occurred in various parts of Europe during the Middle Ages. There were no serious outbreaks of plague in England after 1666. Insanitary conditions and lack of knowledge of the mode of spread of the disease were undoubtedly important factors in the continuance of bubonic plague in Europe through several centuries. Another factor of importance in the spread of the disease is that chronic or resolving plague in rodents furnishes a reservoir of infection from which fresh outbreaks may occur.

After establishment of the fact that rats were the reservoir of the infection and that the fleas carried the organism from rat to rat and from rat to man, the Marine Hospital Service rapidly developed effective means of plague control within an infected area. These campaigns for the control of plague were based on five general principles of operation: (1) Early recognition and isolation of human cases; (2) the trapping of rats throughout the infected area; (3) the laboratory examination of all

trapped rats to determine the presence or absence of plague infection; (4) the ratproofing of all buildings within the area; and (5) protection of outgoing shipping by anchoring away from docks and by fumigation.

CAMPAIGNS AGAINST PLAGUE

A campaign for the control of plague is very expensive. There must be a sufficient force of rat-trappers to cover the entire area, and sufficient wages must be paid to attract suitable persons. They are furnished traps and bait. The number of traps that a man can handle varies greatly with the territory—whether it is a congested downtown business section, a suburban community, or a semirural area, and whether he is handling snap traps or cage traps. The number of traps per man will range from 30 or 40 to 150 or perhaps more depending on the territory. These traps must be visited at least twice daily, also there must be close supervision of the traps to be sure that bait is always present. The trapped rats are removed and labeled with the specific address, so that if found infected in the laboratory, their exact origin will be clear.

A most important part of a plague campaign is a well-equipped, competently-manned laboratory. Each rat trapped throughout the city and outlying areas must be examined individually. Each trapper collects his catch in covered galvanized buckets or cloth bags. Trucks pick up the rats from the trappers and assemble them in large galvanized garbage cans; sometimes cloth bags are used. A daily total may run as high as 4,000 to 5,000 rats. The gross, or macroscopic, examination of these rodents may be undertaken. The laboratory workers look for evidence of plague infection in bubos under the forelegs, in the neck, and in the groins. If plague infection is present, usually it will be at once apparent to the trained and experienced plague laboratory worker. The presence of fluid in the chest cavity, marked reddening of the tissue under the skin, areas of destruction of tissue (necrosis) in the liver or spleen, enlargement of the liver, and scars upon the spleen at once arouse suspicion. For bacterial verification mass inoculation into laboratory animals of samples of all livers and spleens of rodents examined is also important.

A valuable method for determining the presence of plague in any area under study consists of removing fleas and other ectoparasites from

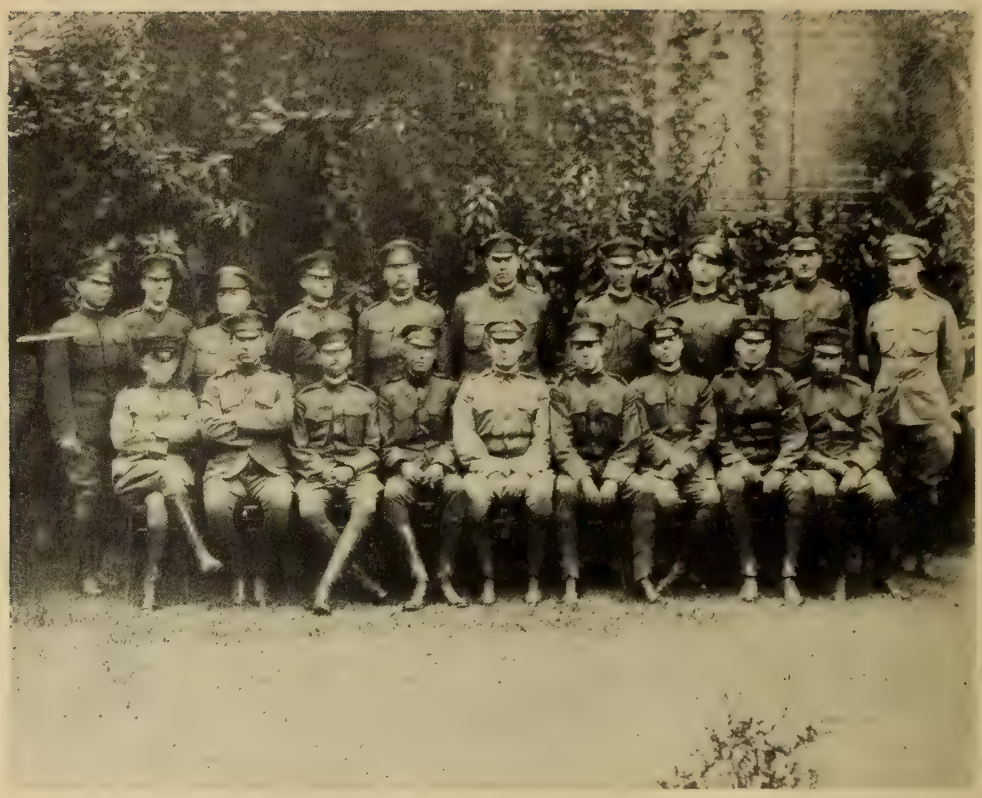
(From USPHS Records)

Bubonic plague campaign, San Francisco, California, 1907-1908.

SEATED (left to right): Drs. Charles W. Vogel, Halsted A. Stansfield, Rupert Blue, Carroll Fox. STANDING: Drs. Richard H. Creel, G. A. Weyer, Chester H. Woolsey, Louis H. Schmitt, Joseph L. Howard, George M. Converse, Arthur D. Prentice, Joseph R. Hurley, Philip M. Thomas, W. Colby Rucker, Howard H. Hopkins, Bruce F. Foulkes.

(Courtesy of Dr. Chester Woolsey, San Francisco, California)

Luncheon by Citizens' Health Committee, San Francisco, 1908, commemorating completion of plague control campaign—its slogan: "San Francisco is so clean a meal can be eaten in the streets." Dr. Rupert Blue was guest of honor.



(From USPHS Records)

Bubonic plague campaign, New Orleans, 1914.

SEATED (left to right): Drs. James M. Gillespie, Hugh de Valin, Norman Roberts, Gustav M. Corput, William Colby Rucker, Richard H. Creel, Friench Simpson, Richard A. Kearny, Charles L. Williams, Sr. STANDING: Drs. Marion S. Lombard, Francis A. Carmelia, Thomas B. L. Layton, Park Howell, George McG. Stewart, H. King, Mark D. Hollis, Pharmacist W. H. Keen, Drs. Harry F. White, Charles V. Aiken.

rodents secured in such areas, macerating them in saline solution, and using this material to inoculate suitable laboratory animals under the skin. These inoculated animals are then observed for the development of plague. Experience has shown that this method in many instances will disclose the existence of infection in an area where examination of rodents has failed to yield positive results. This is particularly true toward the end of an epizootic among rodents when it is often quite difficult to find rodents with visible detectible lesions. This method was veloped by Dr. Clifford R. Eskey of the Public Health Service.

RATPROOFING

In order to prevent rats from finding harborage in buildings, a constant campaign of ratproofing must be carried on. Each building must be thoroughly inspected, and those which do not comply with ratproofing specifications must be ratproofed. To secure the ratproofing of buildings, court action is frequently required. Many owners are quite reluctant and dilatory about spending what to them may be large sums for making their buildings ratproof. Although this is a tedious and disheartening process, the legal enforcement of the ratproofing ordinance is essential to the success of any campaign against plague. A force of trained sanitary and building inspectors is therefore necessary. In addition, there must be maintained a fumigation squad prepared to fumigate buildings when positive plague rats are found during the laboratory examinations. In campaigns against plague in the larger cities, such as New Orleans and San Francisco, it has on occasion been necessary to fumigate completely large department store buildings and vast warehouses. The successful fumigation of such buildings requires careful planning and execution. In addition to the fumigation of buildings, a corps of inspectors must constantly patrol the waterfront to see that ships anchored at the dock are properly protected from the ingress of rats from the shore or from rats aboard the ship coming to the dock.

Ratproofing in the control of plague was first used in the United States during the early campaign in San Francisco. The first actual work of ratproofing buildings was done in an area in San Francisco in 1907.

Epidemic Fund

Over a period of many years, beginning about 1880, there was appropriated annually for the use of the Service a continuing "epidemic fund." The existence of this "epidemic fund" was comforting and useful to Federal and State public health administrators. Its main purpose was to have funds available in case of outbreaks of yellow fever and other epidemic diseases. At times the amount was over a million and a half dollars—quite a sum for those days. It was carefully conserved at all times. The scrupulous administration of this fund on the part of the Service secured the confidence of the Congress in the integrity and competence of the Marine Hospital Service.

Relations With Local and State Authorities

It should be emphasized that officers of the Public Health Service, while working within a city or State during an outbreak of plague, yellow fever, or other diseases, are not exercising Federal authority. During both outbreaks of plague in San Francisco, and in the occurrence of yellow fever and plague in New Orleans as well as in all other cities, officers of the Service assigned on such duty were in one manner or another clothed with authority as officers of the official local or State health organization. This enabled these Service officers to exercise local police power if such were necessary. As previously noted Federal authority in health matters does not extend to participation in, or the exercise of, local police power. The authority of the Service officers as representatives of the Federal Government is concerned with interstate or international matters. This may seem to be a minor technicality but, from the standpoint of relationships among local, State, and Federal health authorities, it is vitally important that there be a clear understanding of the powers of each.

This should not be confused with the legal right of the Public Health Service to conduct investigations relating to health anywhere within the United States. Prior to undertaking proposed studies in a locality, plans are always discussed with State and local health authorities.

There is authority in exisiting law for the Service to issue regulations to prevent the introduction and spread in interstate traffic of communi-

cable diseases which State and local health authorities are authorized to enforce. If they fail or refuse, the Public Health Service may itself enforce the regulations. This action within a State is independent of local police authority.

Conferences of State and Territorial Health Officers With the Service

Important in advancing cooperation with State health departments was provision contained in the Act approved July 1, 1902, authorizing the Surgeon General to hold conferences with the State and Territorial Health Officers when in his opinion the interests of the public health would thereby be promoted. An annual conference was mandatory. Thus was provided the first legal authority for official periodic conferences with the State health departments. Included in the Act was the provision that, upon request of not fewer than five State health officers, the Surgeon General was required to call a conference. The first conference held under this law was at the insistence of Dr. John S. Fulton, State Health Officer of Maryland. It was this meeting that convinced the California authorities that anti-plague measures must be undertaken at once. The present law reads:

> Sec. 312. A conference of the health authorities of the several States shall be called annually by the Surgeon General. Whenever in his opinion the interests of the public health would be promoted by a conference, the Surgeon General may invite as many of such health authorities to confer as he deems necessary or proper. Upon the application of health authorities of five or more States it shall be the duty of the Surgeon General to call a conference of all State and Territorial health authorities joining in the request. Each State represented at any conference shall be entitled to a single vote. Whenever, at any such conference, matters relating to mental health are to be discussed, the mental health authorities of the respective States shall be invited to attend.

For several years before 1902 there had been meetings of groups of State health officers with the Marine Hospital Service, but usually they were on a regional basis. For example, if there were a sharp outbreak of smallpox in Canada, the State health officers of that area adjoining Canada might request that the Marine Hospital Service impose a strict quarantine against persons entering from Canada. A conference would then be held to consider the various aspects of the problem.

Obviously, there is an advantage in having all State health officers attend conferences at regular intervals so that a more complete health picture may be obtained. These annual conferences with the State health departments have proved to be of great value as they provide an opportunity for the State health officers and representatives of the Service to become personally acquainted and to develop a mutual understanding in matters of common interest. Then, too, they bring together the State health officers and give them the opportunity to become familiar with the problems confronting other sections of the country. All of this makes for better understanding and provides a basis for unity of thought and action among State health authorities throughout the country.

During the era when yellow fever was still prevalent, the control of that disease, of course, required a large share of consideration. Later, the Conference became the occasion for the Service and various workers in the States to discuss advances in methods of prevention and control of disease, interspersed with a discussion of administrative problems and relationships. With the coming of the Federal grant-in-aid systems for health work under the Social Security Act of 1935, there arose the necessity for developing acceptable rules and regulations concerning the requirements for utilization of the Federal grant-in-aid funds for various types of health activity. It is a source of pride to the Service and to the State health officers that since the inauguration of these annual conferences nearly 50 years ago, there has come about a fine spirit of understanding and cooperation between the State health officers and the Public Health Service.

Evolution of Public Health in States

In the United States public health work from a local, State, and Federal standpoint has evolved through trial and error over a period of more than 80 years. Outstanding contributions to public health administration have been made by many State and local health officers. Important developments have come also from persons not actually engaged in the public health field. Matters having public health connotation were sometimes undertaken in areas of State or local government not con-

nected with what might be considered health work. The control of food and drugs, or water supplies for towns and cities are examples. It would not be amiss to record here some important contributions to public health of a few of the State and local health officers, though this record must by no means be considered complete.

One of the early leaders in the field of public health was Dr. Samuel J. Crumbine, State Health Officer of Kansas for almost 20 years (1904-1923). The first pure food law dealing with adulteration of food was enacted by the Kansas Legislature in 1889. A second food law was enacted in Kansas in 1905. However, in February 1907 a really effective food and drug law became operative. Doctor Crumbine carried on campaigns against the house fly, the common drinking cup, the common towel, the separation of ice from drinking water, the abolition of cuspidors on trains, and similar items in the program for public health in Kansas.

In an early campaign against tuberculosis, a company manufacturing brick in Kansas, at the suggestion of Doctor Crumbine, imprinted on the brick the injunction, "Don't spit on the sidewalk." Some of these bricks may still be seen on the sidewalks in Topeka. The slogan, "Swat the fly," originated in Kansas during the time that Doctor Crumbine was State Health Officer.

Dr. Wilfred H. Kellogg, while employed by the City Health Department of San Francisco in 1900, made the first diagnosis of bubonic plague on this continent. This action required moral courage as well as sound scientific training.

Dr. John N. Hurty, health leader in Indiana and the United States, was State Health Commissioner from 1896-1922, and President of the American Public Health Association 1912-13. He was very active in legislation for pure food, drugs, water, and milk, and led the fight against tuberculosis, venereal disease, and the acute communicable infections. He was active in early social and housing reforms, the collection of accurate vital statistics, and sound publicity having to do with health education and instruction of the public. He was the author of most of the basic health legislation in his own State and definitely influenced the course that health work took in the entire United States

during the years 1895-1925. He was fanatical in his zeal for the cause of health, fearless, tireless, and persistent; he was aggressive and sharp of tongue; he was one of the stormy petrels of American public health for more than a quarter of a century.

A father and son, Dr. Joseph N. McCormack and Dr. Arthur T. McCormack, between them served continuously as State Health Officer of Kentucky for a period of 59 years.

Through the efforts of Dr. Herman N. Biggs, who in later years was an enlightened and progressive Commissioner of Health for the State of New York, laboratories to assist in diagnosing communicable diseases were established. The first diagnostic laboratory was in the City of New York where Doctor Biggs offered, in 1893, to assist in the diagnosis of diphtheria. The example of New York was followed by a number of cities in the following years.

Dr. Charles V. Chapin, Health Officer of Providence, Rhode Island, for 48 years (1884 through 1932), in 1905 led the way in abolishing useless and ineffective fumigations following the occurrence of communicable diseases.

Dr. William H. Welch of Johns Hopkins University Medical School, one of the pioneer bacteriologists of the United States, and member of the Advisory Board of the Hygienic Laboratory for several years, shortly after World War I saw the need for establishing schools of public health to train public health workers. It was through his efforts that the first school of public health was established in the United States in 1919—the Johns Hopkins School of Hygiene and Public Health in Baltimore.

The furnishing of accurate information to the public concerning health matters is a vital component of public health work. Dr. William A. Evans, who served as Health Commissioner of Chicago for four years, was one of the first persons to prepare a health column in a large daily newspaper. Beginning in September 1911, his column in the *Chicago Tribune,* "How to Keep Well," was widely read for almost 23 years. This column was syndicated and used by a number of other daily newspapers throughout the country. Through such a medium, popular material prepared by a competent and careful authority provides authentic information concerning personal and public health to news-

paper readers and the general public. Reliable health information is important in stimulating public interest in health matters and in maintaining concern about the needs and progress of public health in a given community.

As early as 1872, Dr. Jerome Cochran of Alabama recognized the need for integrating the interest and support of the medical profession with public health work. Through his efforts the Alabama State Board of Health was established with very close affiliation and direction on the part of the State Medical Association.

Dr. Thomas M. Crowder, Medical Director of the Pullman Company, was especially effective in providing leadership for improved sanitation on railway trains. During his long career he earned and retained the confidence of local, State and Federal health officials.

In the field of environmental sanitation William T. Sedgwick and others laid the foundations for the development of sanitary engineering and related activities in the health field. He served for several years as a member of the Advisory Board of the Hygienic Laboratory.

The International Health Board of the Rockefeller Foundation, through the campaign for the eradication of hookworm disease that began in 1911, served to create interest in local health work. With the discontinuance of the campaign for the eradication of hookworm disease after a period of five years, efforts of the Foundation were directed toward stimulating developments in health work in various important fields. Dr. John A. Ferrell, for more than 30 years associated with the Rockefeller Foundation, gave outstanding leadership in this phase of the Foundation's program.

County Health Work

An important step in the evolution of public health work in this country was the development of local health work on the county basis. This evolution was not immediate and clear-cut, but was based on a "trial and error" method in the field that led ultimately to the adoption of principles that are generally considered to be sound.

The approach of the Public Health Service to the specific field of rural health work was mainly through studies of typhoid fever con-

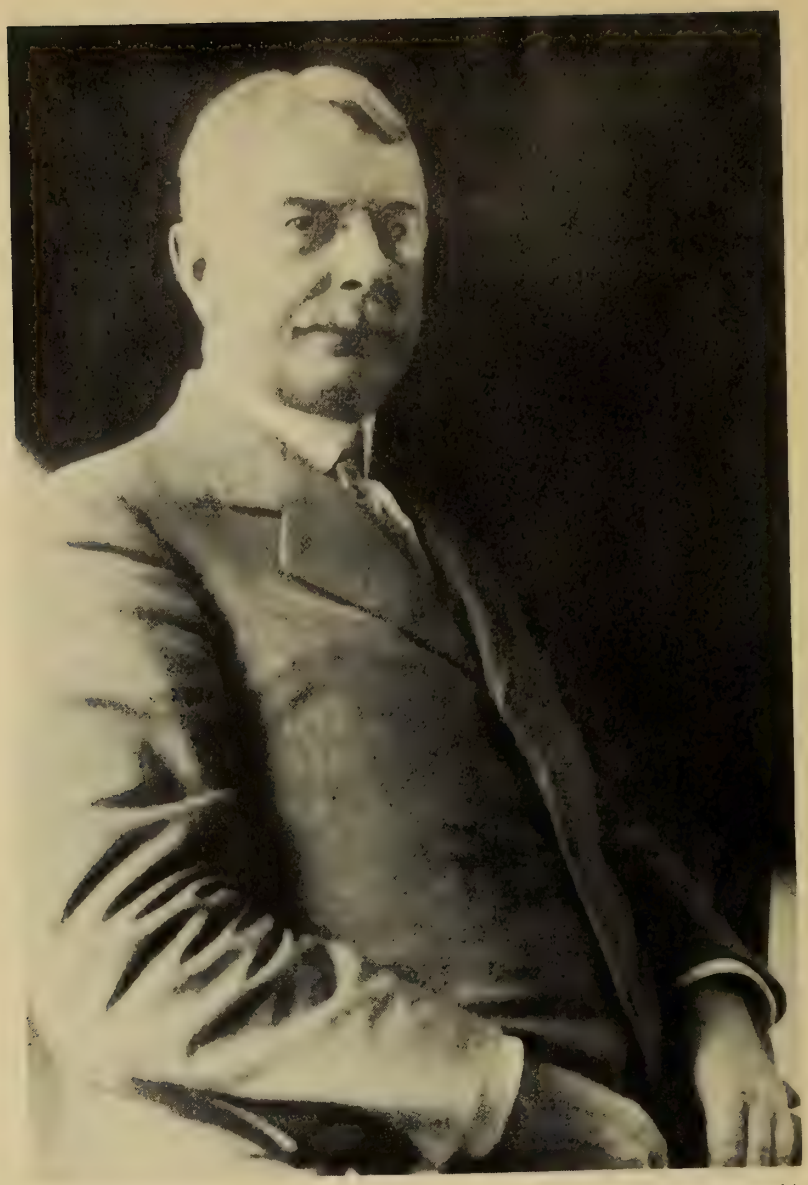
ducted by the Service. In the course of studies of typhoid fever epidemiology made in the period 1906-1910 in Washington, D. C., and a number of other cities in the United States by a medical officer of the Service, Dr. Leslie L. Lumsden, impressively frequent instances were observed in which cases of the disease developing in Washington, D. C., had been caused by the infection brought in through the medium of persons and of water, milk, oysters, or some other food supply from a nearby or distant rural community. Observations were also made, in cases studied within and subsequent to the above-mentioned period, where in numerous instances a household or a neighborhood outbreak of typhoid fever in a rural community was caused by infection introduced by a person who, after contracting it in a city and while in the incubation period of the disease, had come from the city to visit or reside in the rural community. The rate of typhoid fever prevalence at that time was high. The death rate from the disease for the period 1890 to 1910 in the United States was more than three times that of some of the other countries of the world. Typhoid fever, therefore, at that time was one of our major sanitary problems. As the disease was spread through commerce and otherwise from rural community to city, from city to rural community, from county to county within the States, and from State to State, the problem of control or prevention was one with which all our official health agencies, local, State and Federal, were concerned.

Notable sanitary progress had been made in most of our large cities in the period 1890 to 1910, but little or no improvement had been made in our open country communities, villages, towns, and small cities generally.

At the annual conferences of State health officers with the Public Health and Marine Hospital Service from 1906 to 1911, the prevailing opinion among the more experienced officers appeared to be that, though there was critical need for rural sanitation, no practical means had been proposed which offered hope for success in that field. Some of the younger participants in those conferences believed strongly, yet without certainty as to detail, that a plan of action could and should be evolved to relieve the situation. This belief was based on the recognition of the high level of intelligence of our rural population and the progress mani-

(From USPHS Records)

Dr. Leslie L. Lumsden



(From USPHS Records)

Dr. Charles Wardell Stiles

fested by those people from year to year in accepting and using improved methods in their agriculture, stock raising, and other important business.

In the spring of 1911, Doctor Lumsden was assigned by the Service, at the request of the local government authorities and State health department, to make a study of typhoid fever in the city of North Yakima, and the county of Yakima, in the State of Washington. Assurance was given in advance by the city Chamber of Commerce that the measures to be recommended for the control of the disease would be actively supported. The studies were made in cooperation with representatives of the State health department and the local part-time health agencies. The high incidence rate of typhoid fever with an annual death rate of about 200 per 100,000 population (over five times that for the United States as a whole), in Yakima city and county during the several previous years was obviously due to local insanitary conditions, augmented by climatic, irrigation, and soil factors.

A campaign of county-wide sanitation was instituted and carried out through procedures in some respects comparable to those of a political campaign. The citizens generally became interested and applied at their homes the recommended sanitary measures. By these home improvements, along with the mass sanitary measures carried out in North Yakima and in the towns and villages, a radical change was effected in Yakima county as a whole in the course of a few weeks. As the sanitary improvements proceeded, the typhoid fever rate in the county, instead of rapidly increasing as usual in the early summer, markedly diminished. With public sentiment aroused and the citizens interested in the sanitation program and its continuance, a concerted effort was made, through organization of the local civic leaders, to bring about the establishment of a permanent health service for the county and city. The county commissioners and the city council by formal action established a full-time county health department for Yakima county on July 1, 1911. At the head of the department was a physician trained in public health, engaged to serve on a full-time basis. He was assisted by public health nurses, sanitary inspectors, a bacteriologist, and a clerk, each of whom was on a full-time basis. The health unit in Yakima county has continued in operation since its establishment.

This marked the beginning of the end of the national annual scourge of typhoid fever. It had its origin as far as Doctor Lumsden was concerned in his epoch-making epidemiological studies of typhoid fever in Washington and elsewhere from 1906 to 1910. He became the leading epidemiologist of his time in relation to typhoid fever. Out of his work developed the rural sanitation movement. Dr. Charles Wardell Stiles of the Service had been approaching the rural health problem from the standpoint of hookworm disease, and he and Doctor Lumsden collaborated in problems of soil pollution and excreta disposal.

If not the first, this Yakima County health unit was one of the first full-time county health departments in the United States.

There are conflicting claims as to where the first full-time county health department was established. The records indicate that Jefferson County, in which the city of Louisville, Kentucky, is situated, established a full-time health department in 1908. In Guilford, North Carolina, a full-time county health department was established in 1911.

Without being too much concerned as to exact dates of priority, it is sufficient to say that before the close of 1911 the county health movement was definitely under way in three widely separated States. During the next decade it spread to 186 counties in 23 States. Funds were first provided by Congress for demonstrations by the Service in rural sanitation in an appropriation Act approved February 28, 1916, and in each year following for a period of several years. These funds were allocated to various States to assist and encourage the development of county health work.

Doctor Lumsden became an evangelist for rural health work. Over a period of several years he furnished the enthusiasm, vision, and leadership that was the basis for the important health structure we now know as local health administration.

Hookworm Disease Campaign

The development of local health work was spurred by the Rockefeller Foundation when John D. Rockefeller, Sr., in October 1909, provided for the organization of the Rockefeller Sanitary Commission and made available $1,000,000 for a five-year program for the eradication of

hookworm disease in the southern States. Conducted by the State health departments, this campaign in each county consisted of visits to every community. Talks were given before groups at rural schools, churches, and other community centers explaining the cause, method of spread, and prevention of hookworm disease. At the conclusion of these talks, the method of making a diagnosis of the disease was explained, and containers for fecal specimens were distributed to members of the audience. All were invited to return the following day, with the specimens, for examination, and were assured that those persons found to be infected would be given treatment without cost. In this way thousands of persons throughout the southern States were found to be infected with hookworm disease and were given treatment. These traveling clinics were held in the same community for three or four successive periods at weekly intervals so that persons who received the treatment might return for re-examination to establish clearly that they no longer harbored the infestation.

This campaign reached practically every rural community in the South, and was of great importance in stimulating the development of full-time county health work. Many of the physicians who were engaged in this program against hookworm disease later entered various other types of public health administration.

This donation of funds was directly due to the long-continued field studies of hookworm disease by Dr. Charles Wardell Stiles of the Service. During a return trip from the far South, Doctor Stiles talked about the problem to a fellow passenger in the club car of the train. Doctor Stiles left the train at Washington; the other passenger continued on to New York. He was Thomas Nelson Page. While there, this passenger heard of the desire of Mr. John D. Rockefeller to do some type of health work. He advised the Rockefeller representatives of his meeting with Doctor Stiles and suggested that this might be a profitable field to develop. Contact was made with Doctor Stiles. As a result, the sum of $1,000,000 was set aside by Mr. Rockefeller with the provision that it must all be spent within a period of five years. Doctor Stiles was suggested as field executive, but Surgeon General Wyman would not consent to his leaving the Service for so long a time. In consequence, Dr.

Wycliffe Rose, head of the public school system of Tennessee, was made executive director, and Doctor Stiles, scientific director.

Before the five years were up, Mr. Rockefeller had set aside for the Rockefeller Foundation $100,000,000 in support of international health work. A prolonged effort was made to have this movement developed under authority of a national charter from the Federal Government. Congress would not authorize it. The charter was obtained finally from the State of New York.

Before the original five-year period had expired, Doctor Rose expressed to Surgeon General Blue the desire on behalf of the Rockefeller Foundation to enter a new field of health work that would be more world-wide than hookworm disease promised. The Service had recently extended its malaria studies. It was suggested to him that malaria should meet his description of such a field of health work. In fact, Doctor Rose was invited to take part in studies and demonstrations then under way. On his return to New York he prepared a memorandum of the proposed undertaking for presentation to "his Board" for approval. Before presenting it, he went to Washington again where the memorandum was reviewed with Surgeon General Blue and other officers of the Service.

It was made plain to Doctor Rose that cooperation would be welcome in the manner outlined, provided official leadership was kept constantly in mind and no publicity indulged in that would detract from official development of malaria prevention and suppression in the United States. The arrangement proved entirely satisfactory. Doctor Rose was a wise leader. He was helpful and generous in his relations with the Public Health Service and was esteemed highly because of his broad knowledge, personality, and prudence.

Child Health

One of the significant changes that began taking place shortly after the turn of the century was an increased interest in health matters by those concerned with social and welfare work. This had an appreciable effect on future developments in public health. The participation of women in public affairs had profound influence in accelerating interest

in child and maternal health work and translated this interest into public health program activities and legislation—local, State, and Federal.

During the first 25 years of the 20th century there were many public health problems of national concern requiring attention by the Public Health Service. Funds available for the development of such work were limited. Studies of milk and its relation to public health were begun in 1906, and have been continued systematically since. These studies had for their objectives safety from the standpoints of general health and infant feeding. Results of this study gave impetus to the use of low (143° F. for 30 minutes) temperatures for pasteurization of milk supplies, and to the development of the holding method of pasteurization as contrasted with the flash method in use at that time. In order to determine the relative values of raw and pasteurized milk, an infant feeding station was maintained for several years at the Hygienic Laboratory.

Studies were made of milk-borne epidemics, infant milk depots at home and abroad, and sanitary standards for the protection of clean milk, as well as methods of infant feeding. Some of these studies were published as early as 1909.

Research work on measles by Dr. John F. Anderson and Dr. Joseph Goldberger in 1911 was an important contribution.

Studies by Dr. Milton V. Veldee in the 1930's in relation to scarlet fever added further means for developing a toxoid to protect children against that infection. At about the same time the work of Dr. James P. Leake relating to smallpox was a notable contribution in improved methods of vaccinations.

Investigations concerning hookworm disease in school children in certain southern States were carried out as early as 1912.

In addition to laboratory studies of exanthematous diseases, special attention was paid to outbreaks of cerebral spinal meningitis, as well as infantile paralysis. Studies of this latter disease were begun in 1910 by Dr. Wade H. Frost, Dr. James P. Leake, and other Service medical officers. Thus were initiated the first comprehensive studies in this country dealing with the epidemiology of poliomyelitis. These studies have been continued as outbreaks occur from time to time.

Dr. Joseph J. Kinyoun at the Hygienic Laboratory in Washington was among the first to produce diphtheria antitoxin in the United States.

An important work of the Service in relation to child health had to do with the preparation and control of viruses, serums, and toxins used in the prevention and cure of diseases. Begun in 1902, this included the preparation, maintenance, and distribution of standard units used in the manufacture of diphtheria, tetanus, and other toxins and anti-toxins, and supervision over purity and potency of all licensed and biological products used in medical practice and public health work.

By 1913 several editions and publications on the "Care of Your Baby" had been issued. In 1917 a pamphlet, "Care of the Baby," prepared by a committee of the Child Hygiene Association was issued by the Service.

Investigations having a bearing on deficiency diseases were continued for years in various institutions, homes for orphans, and mental institutions, during which the essential cause of pellagra was determined by Dr. Joseph Goldberger and his co-workers, and specific methods of prevention and cure were devised.

Dr. Walter L. Treadway conducted studies in counties of three widely separated States which had for their objective determination of the health and mental status of children of native and more recently arrived parentage. These studies were undertaken in Arkansas, Delaware, and New York. Investigations relating to medical inspection of schools and sanitary surveys of rural schools were undertaken and published by the Service from 1908 to 1913. Mental studies of rural school children were made in 1916. Special field studies relating to the development, growth, and maturation of children were begun by Dr. Taliaferro Clark and his field staff during 1915.

Studies in child health inaugurated at Hagerstown, Maryland, in 1920, have been continued at intervals. This has provided an unusual opportunity of following the growth and development of persons who were children in 1920 through the years after they had reached maturity and established families of their own.

Knowledge as to the effectiveness of whooping cough vaccine has been materially advanced by the studies conducted by Dr. Joseph A. Bell.

The development of continuous caudal analgesia for use in obstetrics by Doctors Robert A. Hingson, Waldo B. Edwards, and James L. Southworth in 1941 has been the means of placing in the hands of obste-

tricians an important method of obstetrical anesthesia that has been particularly effective as a means of reducing infant mortality. In the United States Marine Hospital in New York between the years 1942 and 1950 in more than 3,000 deliveries with this technique the uncorrected infant mortality was 16.2 per 1,000 live births. In the Philadelphia Lying-in-Hospital between 1943 and 1945 2,500 deliveries under caudal analgesia resulted in a loss of 20.6 per 1,000 live births, and in a controlled series in the same institution of 1,000 deliveries managed by systematic sedation and inhalation anesthesia the uncorrected infant loss was 45.6 per 1,000 live births. In Memphis, Tennessee, where the infant mortality was the highest in the United States from 1923 to 1933 for an average mean of both white and colored of 120 per 1,000 live births, it was found that there was a consistent reduction of both stillbirth and neonatal mortality in those cases managed under caudal analgesia than that seen in a simultaneous controlled series with spinal, general, and no anesthesia. The results of this study between the years 1946 and 1948 revealed that the total infant loss in 1,248 caudal deliveries was 36.8 per 1,000; in 310 spinal deliveries it was 74.2 per 1,000; in 355 general anesthesia deliveries it was 73.2 per 1,000; and in 535 cases having no anesthesia it was 144 per 1,000. The higher death rate in the latter series from Memphis can be accounted for by the fact that more than 80 percent were Negro patients. Major comparative studies in St. Louis, Memphis, Philadelphia, and New York, have revealed that infant mortality in the premature group can be cut in half by the use of this caudal technique, which is recommended as the procedure of choice in all English textbooks on obstetrics and anesthesia.

With the establishment of the Children's Bureau in the Department of Labor by an Act of Congress in 1912, there was formed in the Federal Government a nucleus of determined workers who firmly established child and maternal health work at a Federal level and later were instrumental in the expansion of this work in the State and local areas. The child and maternal health work of the Children's Bureau was given a strong impetus by the Shepherd-Towner Act of 1921. This Act created a Board of Maternity and Infant Hygiene and specified that this Board should consist of the Chief of the Children's Bureau, the

Surgeon General of the Public Health Service, and the United States Commissioner of Education. The legislation establishing this program in the Children's Bureau was approved November 23, 1921. Later, the Crippled Children's Program was added, and with the coming of World War II, the Emergency Medical and Infant Care Program was inaugurated.

On July 16, 1946, the Children's Bureau was transferred from the Department of Labor to the Federal Security Agency and made part of the Social Security Administration, a new and important phase of Federal organization in the interest of social betterment.

Growth of the modern public health movement over the past five or six decades has re-emphasized the complexity of present-day life and the many factors influencing health and disease. These had to do not only with hygiene and sanitation, but also with economic, political and social conditions affecting public welfare.

Social thinking has been in a state of flux, greater perhaps in relation to health and social betterment than in most other fields of human activity. Not only has there been great advancement, but more or less confusion because of the areas involved. In order that both health work and social work may receive adequate attention in relation not only to children but to other population groups, there will be ever-widening need of cooperation and clarity of purpose.

Within recent years many officers of the Service have become increasingly aware of the profound changes taking place in the social and economic thinking of the present generation. The changing times and conditions as they affect the public health are accurately reflected by the growth of Service participation in collaborative endeavors with other governmental agencies in health work.

As an essential means of cooperating with State and local authorities, child health activities at the Federal level should be thoroughly coordinated so as to avoid duplication and to promote efficiency. Perhaps in time, through cooperation and readjustments of functions, the two fields of health and social welfare will be occupied by the Public Health Service on the one hand and the Children's Bureau on the other so as to discharge fully the responsibilities which the Federal Government should properly assume in the field of child health.

Vital Statistics in the United States

Vital statistics in the United States may be said to have undergone four stages of development. Historically the first colonial legislative session on this continent (Virginia Colony in 1632) enacted a vital statistics law. Seven years afterwards, however, an important step was made in vital registration history, when the Massachusetts Bay Colony became the first political unit in the world to enact a law requiring the reporting of births, deaths, and marriages, as such. Before that date, laws had required the reporting of christenings, burials, and marriages. The prime object of the Massachusetts Bay law was to obtain a legal record of births, deaths, and marriages. Thereafter, all colonies and States undertook efforts to inaugurate systems of vital records.

The second period began in 1842, when Massachusetts became the first State to exercise control over vital records at the State level. Before 1842, vital registration was carried on by local areas with no central control. Lemuel Shattuck was a prime mover in this drive and was also highly instrumental in securing mortality enumeration in the 1850 census, thus inaugurating national vital statistics by the Federal Government.

Vital statistics, as a Federal activity, was more highly developed by a physician, Dr. John Shaw Billings, who had charge of vital statistics in the censuses of 1880 and 1890. Through Doctor Billings' efforts, mortality schedules were first used by the Census Office as a supplement to mortality enumeration. At the end of this period, the American Public Health Association was considering the adoption of basic principles for a vital statistics law, and the basis for a clarification of causes of death was well on the way to adoption.

The establishment of a permanent Census Office in 1902 and the joint efforts of the Census Office and the American Public Health Association in developing the framework for effective State vital statistics systems ushered in the third stage of vital statistics. In the first part of the twentieth century, a model vital statistics law was drafted, standard birth and death certificates were developed, and statistical definitions and tables were agreed upon.

The Census Office established registration areas which State vital statistics offices could become eligible to enter when their vital statistics activities measured up to certain specifications, including at least 90 percent completeness of registration. Many professional and public-spirited organizations joined with Federal agencies to bring all States into the registration areas. Among the important organizations were: U. S. Public Health Service, American Bar Association, American Medical Association, American Federation of Labor, American Public Health Association, and the U. S. Children's Bureau. Dr. Cressy L. Wilbur, Chief Statistician for Vital Statistics in the Bureau of the Census (1906-1914) was very active in the expansion of the death-registration area and the promotion of the birth-registration area.

In 1933 the birth- and death-registration areas included all States for the first time and vital statistics entered its fourth and present era. Major emphasis could then be placed upon qualitative aspects of the subject; for example, intensive efforts were devoted to obtaining more accurate data on certificates, restricting access to vital records, and adapting vital records to serve public health, welfare, and demographic needs.

Present efforts are concentrated on further improvement of the information obtained on birth and death certificates and on the development of additional health and population data which can be related to vital records. Such interrelated information is needed in the planning of public health and social welfare programs.

The Division of Vital Statistics of the Bureau of the Census was transferred to the Public Health Service on July 16, 1946, and redesignated as the National Office of Vital Statistics of the Public Health Service.

Administrative Problems of the Service

The following events that took place in the 1920's are cited as an illustration of the difficulties under which the Public Health Service labored for years in shortages of personnel and funds. The many pressing requirements made it necessary to spread the commissioned corps so thin as to almost reach the breaking point.

A disastrous flood occurred in the Mississippi Valley in 1927. The Public Health Service found it necessary to assign 20 officers for disaster relief in flooded areas. In 1924 a serious outbreak of bubonic plague occurred in Los Angeles. Twelve commissioned officers were assigned to that duty. The inauguration in 1925 of the policy of examining prospective immigrants to the United States in the principal countries of origin in Europe had imposed a serious drain upon the commissioned corps. Sixteen percent of its regular officers were on immigration duty in Europe in 1927. It seems almost incredible that during these years the Public Health Service operated with not more than approximately 180 commissioned officers on active duty at any given time to cover all its activities, including foreign assignments and emergencies. That the hospitals were often in straits, that scientific research proceeded at the slow pace associated with insufficient personnel and limited facilities, that the development of public health work in the States progressed by small advances, was inevitable under these circumstances.

The Public Health Service and many State health authorities had learned, through 15 years of demonstration and experience in local health work, that permanent improvement in national health could be expected only when every county was served by a qualified full-time health department or as a constituent of a local health unit. The Service had fought to extend this type of health work, but by 1928 meager assistance could be given to only 204 counties in 17 States. The Service had only $350,000 to spread among them annually. It was in that prosperous year before the Wall Street crash that the Public Health Service revealed in a single sentence something of the discouragement that it was meeting. "At the present rate of progress," wrote Surgeon General Cumming in his Annual Report in 1929, "about 51 years will be required before all of the rural communities in the United States will be receiving adequate health services, the lack of which is now responsible for an annual economic loss of $1,000,000,000."

DISTRICT OFFICES ESTABLISHED

In order to meet the heavy responsibilities imposed upon the Service in 1919 in connection with the care and treatment of sick and disabled veterans, it was necessary to decentralize certain phases of the work to

the field. This was accomplished by the establishment of 14 district offices throughout the continental United States, each under the direction of an experienced medical officer. These district offices were established in 1920 and abolished in 1922 when the medical care for veterans was transferred to the newly-established Veterans' Bureau.

In 1921, the Domestic Quarantine Division (later called States Relations Division) in the systemization and coordination of its activities relative to the supervision of water supplies on interstate carriers, found it necessary to establish nine interstate sanitary districts. Sanitary engineers were in charge of these districts and, in addition to their activities concerning interstate carrier water supplies, furnished assistance to States in sanitary engineering matters.

In 1923, seven public health districts were established in the continental United States and an experienced Service officer was assigned to act as director in each district. These districts were as follows:

(1) District of the North Atlantic
Director—Dr. Allan J. McLaughlin, New York, New York

(2) District of the Middle Atlantic
Director—Dr. Benjamin S. Warren, Baltimore, Maryland

(3) District of the Great Lakes
Director—Dr. Claude C. Pierce, Chicago, Illinois

(4) District of the Gulf
Director—Dr. Louis L. Williams, Sr., New Orleans, Louisiana

(5) District of the Missouri
No assignment made. This was later consolidated with the Great Lakes district.

(6) District of the North Pacific
Director—Dr. George M. Magruder, Seattle, Washington

(7) District of the South Pacific
Director—Dr. James C. Perry, San Francisco, California

In 1925, the interstate sanitary districts were reduced in number and consolidated with the public health districts.

FUNCTIONS OF THE DISTRICTS

The organization of these public health districts, seven of which were established in the first year, did not decentralize the administration of Public Health Service stations and activities; however, the appointment

of experienced medical officers of the Regular Corps, as District Directors, served to coordinate the Service activities. The work of the District Directors was to cooperate with State and local health authorities and unofficial health agencies, to coordinate activities of the Service within the District, to inspect Service stations, and to recommend improvements in administrative procedures. The District Office organization proved of great value and usefulness 12 years later when the relationship of the Public Health Service and the State health authorities became of paramount importance in the administration of grants-in-aid for health work to the States under the Social Security Act.

A survey of the research activities of the Public Health Service during this period indicates that from the years 1922 to 1936 workers of the Service in the laboratory and in field investigations had to conduct their activities with a minimum of personnel and funds, and yet, thus handicapped, they made valuable contributions to public health and to the solution of problems which became of critical importance during World War II. The provisions of the Social Security Act for the expansion of research in the Service made it possible to concentrate attack in several profitable fields which had been opened by previous investigations. Only five years intervened between this expansion and World War II, but sufficient knowledge had been obtained upon which to base intensive research on problems directly related to the war effort.

Federal Activities in Public Health

GRANTS-IN-AID FOR PUBLIC HEALTH

The Social Security Act of 1935 marked the beginning of an important public health era in the United States. Included in this Act was Title VI which authorized general health grants to States by the Public Health Service. Under this Title of the Act, authority was granted for:

1. An annual appropriation of not to exceed $8,000,000 for the purpose of assisting States, counties, and health districts and other political subdivisions of the States in the establishment and maintenance of adequate health services, including the training of personnel for State and local health work.

2. An annual appropriation of not to exceed $2,000,000 to the Public Health Service for research activities of the Service and for the expense of cooperation with the States in the administration of the Federal funds granted for aid in the establishment and maintenance of State and local health services.

The aim of this legislation was to stimulate a comprehensive, nationwide program of public health, financially and technically aided by the Federal Government, but supported so far as possible and administered by the States and local communities. Funds provided for allotment and payment to the States under this authority were utilized for:

(a) Strengthening State and Territorial health departments, or bureaus or divisions of such departments, and providing adequate facilities especially for promotion and health guidance of district, county, and city health services.

(b) Through the State and Territorial health departments, strengthening or aiding in the development of district, county, and city health services.

(c) The training of personnel employed, or to be employed, in State and local health departments.

Under Title VI of the Social Security Act the Public Health Service was authorized to allot $8,000,000 annually in grants-in-aid to State health departments. The appropriation of $2,000,000 annually for scientific research was also authorized. The law further provided that the distribution of funds to the States should be based proportionately upon population, financial need, and the existence of special health problems. These funds were not given without what may legally be termed a consideration, as the States were required to match dollar for dollar the sums appropriated for general health services and special health problems. A part of the grants-in-aid appropriation was reserved for the training of State and local health personnel. Funds allotted for training, however, did not have to be matched. Regulations for the administration of grants-in-aid funds under Title VI of the Social Security Act were promulgated by the Public Health Service after conference with the State and Territorial health authorities. Funds authorized by the Social Security Act first became available on February 1, 1936, when Congress appropriated $3,333,000 for the remaining five months of that fiscal year.

Thus, for the first time in the history of the United States, the Federal government entered into a partnership with the States and Territories for the protection and promotion of the health of the people. For the first time the Public Health Service was under legal authority cast in the role which it had so long wished to play, that of partner, adviser,

and practical assistant to the State health departments, and through them to municipal and local health services. The policy of the Public Health Service in the administration of Title VI and of all succeeding legislation involving grants-in-aid to the States for health work has been to set minimum standards for activities to be accomplished with Federal aid, and to leave the administration of these activities to the States. Consultant and technical services have been provided for the States in the planning of both general and specific programs. Personnel of the Public Health Service frequently have been assigned to the States upon request to administer health programs.

Public Health Program Expanded

Few foresaw on the bright April morning in 1936, when Dr. Thomas Parran took oath of office as Surgeon General, that less than four years later Germany would throw the major powers of Europe into a war which was to lead to world-wide conflict. Nor was it clearly foreseen that the United States would be strengthening her military and industrial resources for defense. It is all the more significant that the three years, 1936-1939, were to see more changes strengthening and expanding the Public Health Service than were seen in any 10 years of its previous experience.

In 1938 the Lafayette-Bulwinkle Act, approved May 24, implemented the attack upon syphilis and gonorrhea through grants-in-aid to the States and expansion of research specifically upon these diseases by the Public Health Service. In 1939 amendments to the Social Security Act raised the ceiling of grants-in-aid to the States under Title VI to $11,000,000, with provision that the increases should be utilized in the States for special health problems. The National Health Conference of 1938, in which the Public Health Service participated, proposed not only an expansion of public health services but also the construction of hospitals and studies of methods, needs, and resources of public medical care for the indigent.

In 1940 the Public Health Service faced confidently the crisis that was to come. State and local health services were in a better position to meet emergencies than ever before. Under appropriations made by

the Congress to the Public Health Service under Title VI of the Social Security Act, the combined funds budgeted for public health services to the people had been tripled. The organization of State health departments had been strengthened. More than 4,000 professional employees of State and local health departments had received training in accredited professional schools. The number of counties receiving some form of full-time health service had increased from 530 in 1935 to more than 1,500 in 1940. Clinics for the diagnosis and treatment of venereal diseases in two years' time had increased from 1,750 to 2,900.

SPECIAL PROGRAMS IN PUBLIC HEALTH WORK

As early as the summer of 1933, the Public Health Service shared in emergency programs designed to give useful employment to people. Under the Civil Works Administration, succeeded by the Federal Emergency Relief Administration, and later by the Work Projects Administration, the Public Health Service began to administer several programs which were to continue until the outbreak of World War II, namely, malaria control, community sanitation, and the sealing of abandoned mines. The second of these programs was for the construction of sanitary privies in rural areas. The third was undertaken to prevent the pollution of streams with acid wastes coming from abandoned coal mines. Another important project, confined to the cities of New York and Detroit, was concerned with the inspection of plumbing in Federal buildings. In November 1934, the Federal Emergency Relief Administration allocated $1,000,000 to the Public Health Service for rural health work. With this fund the 530 existing local health units were enabled to survive and 10 new ones were established.

DUTIES AND POWERS OF THE FEDERAL GOVERNMENT IN PUBLIC HEALTH

Early public health efforts in the United States quite naturally were directed toward epidemics and sudden outbreaks of disease. It is important to examine the functions and limitations of the Federal government in matters relating to health. In this way the role of the local, State, and Federal governments in public health matters can be more accurately defined and better understood.

The basic authority under which the people of the United States take measures to insure domestic tranquillity, to provide for the common defense, to promote the general welfare, and to secure the blessings of liberty, emanates from the Federal Constitution which became effective in 1789 after having been ratified by all of the original States.

By their joint action the States then existent, and those created since, relinquished forever certain powers to the Federal government. These powers are exercised through a legislative branch authorized to make laws, an executive branch to administer the laws, and a judicial branch to interpret them.

Not all of the powers of the States were thus relinquished to the Federal government. Those not so delegated by the Constitution nor prohibited by it were reserved to the States themselves or to the people. This division of authority is difficult of full explanation; indeed, hard and fast lines of demarcation have only been laid down coincident with the growth and changing conditions of the country.

The fact that the Federal government does not exercise a particular function affecting more than one State does not mean, however, that it is without power to act, but rather that the time has not seemed ripe to do so. In other words, the Federal government undoubtedly has potential as well as active powers, the former of which may not be exercised as long as the States individually exercise them or the need for exercising them has not yet arisen.

Nowhere in the Constitution is there express delegation of public health powers. These powers, therefore, are exercised by the Federal government under constitutional provisions relating to the: (1) Regulation of commerce, (2) taxing to promote the general welfare, (3) making of treaties, and (4) supervision of Federal territory and reservations.

While the Preamble to the Constitution states that one of the objects to be accomplished is the promotion of the general welfare, this has been interpreted to be declaratory and not of legal effect. Any welfare activities must, therefore, come under the provisions cited, including the taxing power. This power is supplemented by that of making appropriations in the support of the Government.

All Federal laws relating to public health have accordingly been enacted under authority of the Constitution as follows:

Art. 1, Sec. 8, Par. 1, The Congress shall have power to lay and collect taxes, duties, imposts and excises to . . . provide for the common . . . welfare of the United States . . .

Art. 1, Sec. 8, Par. 3, The Congress shall have power to regulate commerce with foreign nations, and among the several States, and with the Indian tribes.

Art. 1, Sec. 8, Par. 17, The Congress shall have power to exercise exclusive legislation in all cases whatsoever over such district . . . as may, by cession of particular States and the acceptance of Congress, become the seat of Government of the United States, and to exercise like authority over all places purchased by the consent of the Legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, dockyards and other needful buildings.

Art. 2, Sec. 2, Par. 2, He [the President] shall have power by and with the advice and consent of the Senate to make treaties . . .

While there is diversity of opinion as to the full purport of the several powers mentioned, the one providing for the "regulation of commerce" is of greatest practical application. This involves the exercise of police powers over interstate and national affairs and has been given more liberal construction in recent years. The police power relating to health, safety, and morals within State borders on the other hand has been specifically reserved to the States themselves.

In the broad sense, any law or measure having for its object the promotion of prosperity and the general welfare has a bearing on health. As examples, may be cited the compilation of the decennial census, the control of the purity of foods and drugs sold in interstate commerce, and the prevention of false and misleading claims of advertising matter regarding medical products sold in interstate commerce.

The following are the fundamental health functions over which the jurisdiction of the Federal government extends in public health matters:

(1) Medical care of beneficiaries specified by Federal law.
(2) International health relations.
(3) Interstate health relations.
(4) Scientific research and investigations.
(5) Intragovernmental health relations.
(6) Collection and dissemination of information relating to public health and sanitation.

Functions of the Service in international health relations include preventing the introduction of disease from without through maritime, air, and border quarantine, medical examinations of prospective immigrants, the negotiation and carrying into effect of international treaties or agreements relating to health, such as reporting the occurrence of epidemic and pestilential diseases, and control of the interstate spread of disease.

While Federal powers with respect to traffic between the several States are far-reaching, these in large part have been potential. The equity of our form of Government predicates as full autonomy as possible for all of its component parts. By reason of the fact that the exercise of police powers over matters of health and sanitation within the States devolves upon their authorities, it is only when these matters affect other States that they come within the jurisdiction of the Federal government. Even then the health authorities of the several States are relied upon, and it is only when they fail or refuse to take necessary measures to prevent the spread of communicable diseases that may involve interstate traffic that the Federal government may exercise its superior authority.

Medical care of beneficiaries of the Federal government specified by law include care of the Indian tribes, medical care of merchant seamen, Federal employees injured in line of duty, veterans, persons afflicted with leprosy, officers and crews of vessels of the Coast and Geodetic Survey, personnel of the Coast Guard, Army, Navy, and Air Force, and other small miscellaneous groups such as cadets and enrollees of the U. S. Maritime Service, and seamen employed on Army transports and on vessels of the Mississippi River Commission.

SUPERIOR AUTHORITY OF THE FEDERAL GOVERNMENT

Regulations exist designed to prevent the introduction of diseases across State lines. However, the Public Health Service is authorized not only to cooperate in their enforcement to prevent the spread of disease, but to promote health by protective means. This is the method invariably taken. The wisdom of such policy is shown by the substantial growth of State and local health departments, the cordial spirit of cooperation that prevails, and the definite advances that are being made in many phases of public health work.

Examples of cooperation between Federal and State health authorities include demonstrations and assistance in general health work, including campaigns for the detection and prevention of venereal diseases, tuberculosis, cancer, and, more recently, certain chronic diseases such as diabetes, arthritis, cardiovascular and similar conditions. Further examples of cooperation are the examination of rodents to ascertain the presence of plague infection, and the supervision of water and food supplies used on vessels, trains, and airplanes engaged in interstate traffic. The limitations of existing Federal laws in this respect may be determined only by future judicial interpretation.

Because of the danger to the public of the exploitation of contaminated or inert biologic products used in the prevention and cure of diseases of man, Congress enacted a law, effective July 1, 1902, to regulate the propagation or manufacture and sale of biologic products in interstate traffic. This law is administered by the Public Health Service.

RESEARCH IN PUBLIC HEALTH

The conduct of research work is a fundamental function of the Federal government. Research in the public health field offers the broadest opportunity for the protection of health and the improvement of sanitation. As early as December 21, 1878, Congress appropriated funds for investigating the origin and causes of epidemic diseases, especially yellow fever and cholera, and the best method of preventing their introduction and spread in the United States. In later years the Public Health Service has been given authority to conduct investigations relating to health. The extent to which research in health may be conducted by the Service is therefore limited only by the facilities and funds provided annually by the Congress. Within recent years there has been an encouraging interest on the part of the public and of the Congress in measures to promote research and to advance the public health.

Advances in medical science and public health data are of value only as they are disseminated for use by public health authorities and the general public. For more than 70 years the Public Health Service has issued the weekly *Public Health Reports* in which appear abstracts of consular sanitary reports from ports throughout the world, articles dealing with scientific studies, and other pertinent information having a

bearing on public health. The collection of information for the Federal government regarding health conditions within the States is entirely voluntary on the part of State and local authorities. Generally speaking, this limitation of authority of the Federal government which, under our system of government, cannot be removed except by constitutional amendment, has not proven to be of serious consequence through the years. There exists in this field an excellent spirit of cooperation between the State and local authorities and the Public Health Service.

INVESTIGATION OF INTERSTATE PROBLEMS

Since health police powers within the State devolve on the States themselves, the function of the Federal government in the prevention of the spread of disease in interstate traffic is largely a matter of cooperation with the States. This function is twofold, administrative and investigative. The administrative work should be largely advisory in nature and relate to the standardization and coordination of methods by health authorities. The investigative functions should include advice and aid. A matter of importance to Federal, State, and local health authorities is the need of current reports of the prevalence of communicable and other reportable diseases as well as information on births and deaths. There must be close cooperation at all three levels of administration to insure the best results. The successful administration of public health laws depends essentially upon a knowledge of the existence and current prevalence of communicable and other diseases, the conditions that favor their spread and propagation, and the measures required for their control.

Important health problems frequently require for their solution large masses of data properly analyzed relating to wide areas and extending over long periods. Obviously, it is not the province of individuals, local committees, or even single States to endeavor to secure this type of information for the nation as a whole. This is a cooperative function which the Federal government should supervise and adequately support.

While police powers in relation to health are retained by the States, scientific research in the field of health by reason of its nature and necessity for continuity cannot be, and has not been, left to the States. While the States can and should aid in such mass investigations as relate

to their jurisdictions, they have the right to expect the Federal government to correlate mass data and systematically to support scientific research, not only of a concrete but of an abstract nature. For the advancement of knowledge relating to health and disease, exceedingly complex and difficult problems must now be studied. In order to do so, adequate investigational facilities and highly skilled scientists are required.

As scientific information is elicited, its dissemination becomes important. New and effective means must be constantly found for this purpose. Publication of articles dealing with improved methods of preventing diseases and advances in sanitation, compilation of the reports of the prevalence of disease, and reports of birth and death rates are important Federal functions. Of equal moment is cooperation with State and local authorities in the adoption of standards, collections of public health data, and methods of public health education, as well as through demonstrations, testing out the application of new knowledge in public health programs and practice.

FEDERAL HEALTH LEGISLATION

The work of the Congress of the United States is accomplished through committee hearings, investigations, debates and actions on bills on the floor of the Senate and House. Many persons familiar with our democratic form of government feel that the work of the various committees of the House of Representatives and the Senate is perhaps more important than actual debate on the floor of either of the chambers. No bill, of course, can become a law until it has been passed by each house and agreement reached in conference between the two houses if the bill passed by one body differs from that passed by the other. The importance of the several committees of the Senate and House is obvious. The organization of the committees of the Congress has changed through the years as the country expanded and as succeeding generations found new problems for consideration.

Widespread epidemics usually have stirred Congress to definite action in health matters. The legislation mentioned below indicates in a general way the relationship between some of the major outbreaks of disease and action by Congress.

Outbreaks of yellow fever in New York and Philadelphia caused Congress to enact legislation in 1794, 1796, and 1799, permitting the Congress to convene at a place other than the seat of government because of the prevalence of disease. The Act of February 25, 1799, also provided for the establishment of quarantine warehouses where goods taken from ships held in quarantine might be stored, and placed the quarantine authority of the Federal government in the Secretary of the Treasury. This Act also was the first authorization for the exercise of Federal power in aid of State and city (port) authorities in health matters.

A widespread epidemic of cholera in the United States in 1833 stimulated the enactment of legislation permitting the use of revenue cutters in enforcing quarantine laws of States and cities. Again in 1866 another outbreak of cholera produced similar action on the part of the Congress.

The yellow fever epidemic that scourged Philadelphia in 1793 made the citizens realize the need for a health department. A board of health was created there in 1794. Fear of the same disease prompted the appointment of a health officer in Baltimore in 1793. The frequent outbreaks of smallpox and yellow fever stimulated the establishment of a board of health in Boston in 1799. The cholera outbreak of 1832 was no doubt largely responsible in bringing about the formation of boards of health in St. Louis, Providence, Chicago, Wilmington, Delaware; and Portland, Maine. The reorganization of the Chicago and Detroit Boards of Health in 1851 and 1893, respectively, and of the Health Departments of New York City and St. Louis in 1866 and 1867, respectively, followed the cholera pandemics of those years. The repeated attacks of yellow fever were influential in causing the enactment of much of the health legislation of the southern States. Thus, the greatest epidemic scourges of the nation—smallpox, yellow fever, and cholera—proved to be the best instruments in hastening the day of public health organization, Federal, State, and local.

ESTABLISHMENT OF THE MARINE HOSPITAL SERVICE

On July 20, 1789, a committee was appointed in the House of Representatives of the First Congress for the purpose of drawing up and introducing a bill to provide for the establishment of hospitals for sick and disabled merchant seamen. The measure did not get out of the commit-

tee, and the matter came up again in the Second Congress on January 21, 1793, and in the Third Congress on December 13, 1793. The measure, however, did not make progress until February 28, 1798, when Congressman Edward Livingston, of New York, from the Committee on Commerce and Manufacturing, reported a bill for the relief of sick and disabled seamen. It passed the House on April 9, 1798, and the Senate on July 14, 1798. It was signed by President John Adams on July 16, 1798. Thus was established the organization now known as the Public Health Service of the United States.

Mr. Livingston had a distinguished public career. He was a native of Clermont, New York, where he was born in 1764. He served as a member of Congress from New York from 1795 to 1801. He was selected by Thomas Jefferson as United States District Attorney for New York in 1801. He became Mayor of New York City in August of that year. During 1803 he rendered conspicuous service in the yellow fever epidemic that occurred in New York City and contracted the disease. He moved from New York to New Orleans in 1804 where he engaged in the practice of law. He was the right-hand man of General Andrew Jackson in the preparations for the attack by the English in 1814. Mr. Livingston served as a member of Congress from Louisiana from 1823 to 1829. He was Senator from Louisiana from 1829 to 1831 when he succeeded Martin Van Buren as Secretary of State in the cabinet of President Andrew Jackson. He resigned from the cabinet in 1833 to accept a mission to France where he accomplished settlement of the French Spoilation Claims. He died at Barrytown, New York, May 23, 1836.

REORGANIZATION OF MARINE HOSPITAL SERVICE

Even before the Civil War, considerable thought had been given to reorganizing the Marine Hospital Service and establishing a central controlling office in Washington. Following the war between the States studies by Dr. John S. Billings and Dr. W. D. Stewart, medical officers of the Army, aided in crystallizing plans for a reorganization of the Marine Hospital Service.

In a letter dated January 26, 1870, addressed to Senator Schuyler Colfax, President of the Senate, Secretary of the Treasury George S.

Boutwell recommended the reorganization of the Marine Hospital Service and submitted a bill to accomplish this reorganization. This bill was referred to the Commerce Committee of the Senate. After consideration of the bill, it was reported to the floor of the Senate by Senator Zacharias Chandler of Michigan, where it was favorably acted upon on February 21, 1870. Congressman Nathan F. Dixon of Rhode Island reported favorably to the House on the bill from the Committee on Interstate and Foreign Commerce of the House. After action by the House this bill became law with the approval of President Ulysses S. Grant on June 29, 1870.

Yellow fever in the southern States and the Mississippi Valley during 1875, 1876, and 1877, culminating in the severe epidemic of the disease throughout the Mississippi Valley in 1878, furnished the stimulus for Congressional action in passing the first national quarantine Act.

The bill that became "An Act to prevent the introduction of contagious or infectious diseases into the United States" was introduced by Congressman Julian Hartridge of Georgia and was reported out by the Committee on Interstate and Foreign Commerce. Senator Roscoe Conkling of New York sponsored this bill in the Senate. It was approved by the President on April 29, 1878.

The creation of the National Board of Health by the Act of June 2, 1879, may also be attributed to the continued widespread epidemics of yellow fever. The National Board of Health expired by limitation after four years.

Yellow fever in the southern States prompted action by Congress in 1883 to appropriate funds to aid State and local boards of health in the control of yellow fever.

A Resolution introduced in September 1888, by Senator Wilkinson Call of Florida to provide funds to suppress infection in interstate commerce was referred to the Senate Committee on Epidemic Diseases. It was reported back favorably and passed. The House concurred in this Joint Resolution which was approved by the President on September 26, 1888, thus making available $200,000. This was directed chiefly toward yellow fever.

In the Senate, a Committee consisting of Senator Joseph N. Dolph of Oregon, Senator Philateus Sawyer of Wisconsin, and Senator Francis

M. Cockrell of Missouri, in 1888, reported favorably on a bill to establish the commissioned corps of the Service. In the House, Congressman James Phelan of Tennessee, Congressman Matthew D. Lagan of Louisiana, and Congressman Charles O'Neill of Georgia reported the bill favorably. After action by both houses, it became law with the approval of the President on January 4, 1889.

In 1890 interstate quarantine authority was given to the Marine Hospital Service by the Congress owing to the continued presence during the summer months of yellow fever in the southern United States. It was under this law, which authorized interstate quarantine regulations, that action was taken in 1900 in San Francisco for the control of bubonic plague. The regulations promulgated under this Act were the first dealing with the interstate spread of disease.

Cholera in Europe emphasized the need for the Quarantine Act of 1893. This strengthened the inadequate Quarantine Act of 1878.

This legislation was handled by Congressman Isidor Rayner of Maryland from the Interstate and Foreign Commerce Committee of the House. Senator Wilkinson Call of Florida, working with Senator Jacob H. Gallinger (a physician) of New Hampshire, took charge of this legislation in the Senate Committee on Epidemic Diseases, and it became law with the approval of the President on February 15, 1893.

NAME CHANGED TO PUBLIC HEALTH AND MARINE HOSPITAL SERVICE

Congressman Leonidas F. Livingston of Georgia, from the Committee on Interstate and Foreign Commerce, reported a bill early in 1902 to increase the efficiency and change the name of the Marine Hospital Service. This was acted on favorably by the House. Senator George C. Perkins of California of the Committee on Public Health and National Quarantine handled this legislation in the Senate. It was approved by the President on July 1, 1902. By this Act, the name was changed to Public Health and Marine Hospital Service and the establishment of specified administrative divisions was authorized. The most important change was that "public health" was placed in the name, thus for the first time designating by name a bureau of the Federal Government in which public health matters could be coordinated. Congressman Wil-

liam Richardson of Alabama assisted with this legislation in the House, as did Senator John C. Spooner of Wisconsin in the Senate.

Another Act approved July 1, 1902, authorized the Service to regulate the sale or transportation for human use of viruses, serums, vaccines, antitoxins, and analogous products in interstate traffic, or from any foreign country into the United States. It is usually referred to as the Biologics Control Law. This legislation was handled by the same committees in the House and Senate and by the same individual members of those committees as the reorganization Act of the same date.

Shortly after the last outbreak of yellow fever in the United States occurred in New Orleans in 1905, the quarantine authority of the Public Health and Marine Hospital Service was further strengthened by the Act of 1906.

FIELD STUDIES AUTHORIZED AND NAME CHANGED

The next important step in the evolution of the Service was the authorization for field investigations and studies. The House of the Sixty-first Congress passed a bill to reorganize the Service which did not receive approval in the Senate. In the Sixty-second Congress, the House, under the leadership of Congressman William Richardson of Alabama and Congressman William C. Adamson of Georgia, approved this bill. Senator Duncan U. Fletcher of Florida handled the bill in the Senate. It was approved by the President on August 14, 1912. This Act omitted the term Marine Hospital from the name, thus the name became the Public Health Service. Investigations of the diseases of man and of the pollution of navigable streams were authorized.

WAR COMES

The world-wide pandemic of influenza in 1918 stimulated the Congress to appropriate $1,000,000 for the Public Health Service to aid in the suppression of influenza in the United States. This influenza outbreak showed clearly the need for the creation of a Reserve Corps for the Public Health Service in order to meet emergency situations. The Act establishing a Reserve Corps for the Service was approved October 27, 1918.

World War I emphasized the importance of the venereal diseases as a public health problem. As a result, the Division of Venereal Diseases was created by Congress and funds for support of a campaign against venereal diseases were made available to the Public Health Service.

AFTER WORLD WAR I

Officers of the Public Health Service were included in a Joint Service Pay Act for the first time in the Act approved May 18, 1920. Congressman Thomas S. Butler of Pennsylvania was Chairman of the Committee on Naval Affairs in the House that considered this pay legislation for the uniformed services. In the House, it was handled by Congressman Patrick H. Kelley of Michigan. Senator Carrol S. Page of Vermont of the Senate Naval Affairs Committee introduced this legislation in the Senate. Senator James W. Wadsworth, Jr., of New York assisted with this bill in the Senate. Mr. Wadsworth later was elected to the House where he has served since leaving the Senate.

Early in the spring of 1928, Congressman Stephen G. Porter of Pennsylvania, Chairman of the Committee on Foreign Affairs of the House and Chairman of the American delegation to the Second Opium Convention at Geneva in 1925, introduced a bill in Congress authorizing the establishment of two institutions for the confinement and treatment of persons addicted to the use of habit-forming drugs. The bill passed both houses of Congress and was approved by the President on January 19, 1929. This Act also created a Narcotics Division in the Public Health Service. The Act of June 14, 1930, changed the name to Division of Mental Hygiene.

During the administration of President Calvin Coolidge, considerable sentiment developed for expanding and coordinating the public health work of the Government. After hearings before appropriate Senate and House committees, both the Senate and the House passed a bill in 1928 to provide for the coordination of the public health activities of the Federal Government. This bill was handled in the House by Congressman Carl E. Mapes of Michigan, an unusually able member of Congress, with the cooperation of Congressman James S. Parker of New York, Chairman of the Committee on Interstate and Foreign Commerce, who introduced the bill in the House. In the Senate this bill was guided by

Senator Wesley L. Jones of Washington and Senator Duncan U. Fletcher of Florida. Senator Jones introduced the Senate bill and was Chairman of the Commerce Committee; Senator Fletcher was the ranking minority member of the committee.

When the bill came to the White House for approval, it was vetoed by President Coolidge on May 18, 1928. This action by President Coolidge was a direct result of the influence of Director of the Bureau of the Budget Herbert M. Lord.

When President Hoover assumed office, this legislation for the coordination of the public health affairs of the Government was again introduced in both houses. Congressman James S. Parker of New York piloted the bill through the House with the assistance of Congressman Carl E. Mapes of Michigan. Senator Wesley L. Jones of Oregon sponsored the bill in the Senate. This bill became law with the approval of the President on April 9, 1930.

PUBLIC HEALTH RESEARCH EMPHASIZED

The decline of epidemic diseases is a direct result of organized public health endeavors and has produced a change of emphasis in public health work. Research in improved methods of prevention and treatment of all diseases is recognized as increasingly necessary.

The Hygienic Laboratory, which had been the principal research station of the Service since 1887, was reorganized, expanded, and the name changed to the National Institute of Health under the Act of May 26, 1930. This Act provided the basis upon which has since been developed the National Institute of Health. Important provisions were authorization for the National Institute of Health to accept gifts and the establishment of fellowships. The first fellowship was established soon after the approval of the Act by a gift of $150,000 presented by Mr. Francis P. Garvin of the Chemical Foundation.

Senator Joseph E. Ransdell of Louisiana was the special sponsor of legislation changing the name of the Hygienic Laboratory to the National Institute of Health. Senator Ransdell served in the House and Senate for a total of 32 years. For several years he was Chairman of the Senate Committee on Public Health and National Quarantine. Senator Ransdell also secured an appropriation of $750,000 to carry on the work

of the enlarged Hygienic Laboratory (now the National Institutes of Health). Congressman James S. Parker of New York guided this bill through the House. Senator Ransdell also secured the establishment of the National Leprosarium at Carville, Louisiana, through the enactment of a bill approved February 3, 1917.

Congressman George S. Graham of Pennsylvania on January 28, 1930, introduced a bill that would make the Public Health Service responsible for medical care in Federal penal and correctional institutions. Senator Frederick Steiwer of Oregon introduced a similar bill in the Senate. This Act to authorize the Public Health Service to provide medical service in the Federal prisons was approved by the President on May 13, 1930.

Senator Hubert D. Stephens of Mississippi sponsored legislation in the Senate for the establishment by the Department of Justice of a hospital for the care and treatment of all persons charged with, or convicted of, offenses against the United States who are in actual custody and who, during their detention or confinement, become insane, afflicted with an incurable or chronic degenerative disease, or so defective mentally or physically as to require special care and treatment not available in existing Federal institutions. This Act to establish a Medical Center for Federal Prisoners was approved by the President on May 13, 1930. This institution at Springfield, Missouri, is administered by the Department of Justice, but the professional staff is from the Public Health Service. The warden is a medical officer of the Service.

SOCIAL SECURITY ACT

An event of major importance in the progress of public health in the United States was the enactment of the Social Security Act of 1935. This authorizes general health grants to States, and was based on the principle that the most effective method to prevent the interstate spread of disease is to improve public health work done as State and local health programs. In the Senate, Senator Pat Harrison of Mississippi, and in the House, Congressman Fred M. Vinson of Kentucky, later Chief Justice of the United States, and Congressman Jere Cooper of Tennessee carried the burden of guiding this legislation through the Congress.

With the decrease in importance of communicable diseases came an increasing emphasis on diseases that were the leading causes of death. Cancer has steadily increased as a cause of death through the years. The National Cancer Institute was established by an Act approved August 5, 1937. Senator Homer T. Bone of Washington and 93 other Senators introduced a bill on March 29, 1937, to establish this Institute. Two Senators were absent that day; hence their names were not included at the time of initial introduction of the bill. They later asked that their names be added, thus making a bill introduced under the name of every member of the Senate, a most unusual occurrence. Senator Royal S. Copeland was especially helpful while acting as chairman at meetings of the conference from the Senate and House in securing acceptance of the bill as finally approved. This bill was handled in the House by Congressman Maury Maverick of Texas. This Act authorized for the first time grants-in-aid to universities or individuals for research and included authority to grant fellowships. It was also the first Act to provide a special advisory council authorized specifically for a particular type of work (cancer).

These developments and changes in viewpoint provided the foundation for the National Venereal Disease Control Act of 1938 which authorized grants-in-aid to States to carry forward the venereal disease program and to intensify research relating to the venereal diseases.

The Venereal Disease Control Act of 1938 was the result of direct interest and support of Senator Robert M. LaFollette, Jr., of Wisconsin. This important legislation was presented in the House by Congressman Alfred L. Bulwinkle of North Carolina. Valuable assistance was given by Senator Royal S. Copeland of New York (a physician).

SERVICE REORGANIZED AND FUNCTIONS BROADENED

Because of the expansion of the work of the Service during the preceding decade and increased activities incident to World War II, it became necessary to reorganize the internal administrative structure of the Service. An Act approved November 11, 1943, reorganized and established four bureaus within the Service. Provision was also made for the temporary promotion of officers and the extension to Service officers of military benefits under specified conditions. Congressman Alfred L.

Bulwinkle of North Carolina guided this legislation in the House. In the Senate, support and leadership were supplied by Senator Elbert D. Thomas of Utah.

In 1944, legislation by Congress broadened the work of the Public Health Service in order to emphasize prevention and control of all types of disease and to provide for general assistance to States in the development of local health work. Following this Act, special campaigns for the detection and prevention of tuberculosis were inaugurated in collaboration with State health departments. Programs for the control of cancer began to be developed about this time.

The Public Health Service Act approved on July 1, 1944, in which for the first time since the organization of the Service there was a consolidation of all laws affecting the functions of the Service, was the direct result of the interest and continued efforts of Congressman Alfred L. Bulwinkle of North Carolina. This important legislation was approved in the Senate by a subcommittee under the chairmanship of Senator Lister Hill of Alabama, and reported to the floor by Senator Elbert D. Thomas of Utah, Chairman of the full Committee on Education and Labor.

Congress continued to manifest interest in health work and, as a result, the National Mental Health Act was approved on July 3, 1946. Congressman J. Percy Priest of Tennessee and Congressman Clarence J. Brown of Ohio handled the bill in the House. In the Senate, this legislation was introduced by Senator Claude Pepper of Florida on behalf of himself and Senators Elbert D. Thomas of Utah, James M. Tunnell of Delaware, James E. Murray of Montana, Robert M. LaFollette, Jr., of Wisconsin, and George D. Aiken of Vermont.

Another important step in the public health program for the entire country was the Hospital Survey and Construction Act of August 13, 1946, which authorized grants to the States for surveying their hospitals and public health centers, for planning construction of additional facilities, and to assist in such construction. The Hospital Survey and Construction Act has proved to be of great value in providing additional hospital facilities and health centers throughout the country, particularly in rural areas. This was introduced jointly by Senator Lister Hill

of Alabama (son of a physician) and Senator Harold H. Burton of Ohio, who soon after was appointed to the Supreme Court. With the departure of Senator Burton from the Senate, Senator Robert A. Taft of Ohio worked closely with Senator Hill in shaping this legislation. Congressman J. Percy Priest of Tennessee guided the bill through the House.

In 1948 Senators Claude Pepper of Florida, Styles Bridges of New Hampshire, Irving M. Ives of New York, and James E. Murray of Montana sponsored a bill which became the National Heart Act of June 16, 1948. Congressman Jacob K. Javits of New York and Congressman Frank B. Keefe of Wisconsin sponsored similar legislation in the House. Congressman Keefe displayed especial interest in health matters for several years. He was of great assistance while Chairman of the Subcommittee on Appropriations in securing approval of funds for the construction of the Clinical Center or Special Research Hospital on the grounds of the National Institute of Health at Bethesda, Maryland.

The National Dental Research Institute Act which became law on June 24, 1948, was the product of a bill introduced by Congressman Walter E. Brehm (a dentist) of Ohio. Senator James E. Murray of Montana was the principal sponsor of a similar bill in the Senate with the assistance of Senator Robert A. Taft of Ohio.

The Water Pollution Control Act approved June 30, 1948, was presented in the Senate by Senator Alben W. Barkley of Kentucky, later Vice-President, and Senator Robert A. Taft of Ohio. In the House, Congressmen Brent Spence of Kentucky, Karl E. Mundt of South Dakota, and Charles H. Elston of Ohio were among the principal supporters of this legislation.

This Act provided for water pollution control activities in the Public Health Service and gave the first broad authority to the Service to undertake a comprehensive program for the abatement and control of water pollution and for the conduct and support of technical research relating to improved methods of treatment of industrial wastes.

A National Institute on Arthritis, Rheumatism, and Metabolic Diseases was established by an Act approved August 15, 1950. This Act also established a National Institute on Neurological Diseases and Blindness, and provided authority for the Surgeon General to establish one or more

additional institutes for study of other particular diseases or groups of diseases whenever the Surgeon General determines that such action is necessary. Senator Claude Pepper of Florida and Congressman J. Percy Priest of Tennessee were the principal sponsors of this legislation, but it had the active support of a large number of other Senators and Representatives who had introduced similar or related bills.

INTERSTATE SPREAD OF DISEASE

The authority of the Federal Government relating to the interstate spread of disease is based on the power to control interstate commerce. For that reason substantive legislation pertaining to health has generally been handled by the Interstate and Foreign Commerce Committee of the House of Representatives. The establishment of the Marine Hospital Service was handled by the Committee on Commerce and Manufacturing in the Fifth Congress and the reorganization of the Service by the Committee on Commerce in the Forty-first Congress because the providing of medical treatment for merchant seamen was related to commerce.

A Committee on Epidemic Diseases was established in the Senate shortly after the Civil War. Later, this committee was called Committee on National Health and Quarantine. It handled bills relating to the Marine Hospital Service and similar matters for many years. Its chairmen were usually outstanding statesmen. Among them were Senator John C. Spooner of Wisconsin, Senator Elihu Root of New York, Senator Jacob H. Gallinger (a physician) of New Hampshire, and Senator Joseph E. Ransdell of Louisiana.

When bills affecting the Service were being considered by this Committee in 1907 or 1908, a Senator recommended that the number of medical officers in each grade of the Service be specified and limited. Senator Spooner dismissed the proposal with the statement that public health was a "growing" function and that it should not be handicapped. Senator Root was sympathetic and helpful in developing support in favor of the bill which became the Act of August 14, 1912. When the Senate Committee on Public Health and National Quarantine was abolished, its functions were taken over by the Senate Committee on

Finance under the chairmanship of Senator Reed Smoot of Utah. Within recent years, and currently (1950), matters affecting the Public Health Service are handled in the Senate by the Committee on Labor and Public Welfare.

It must be borne in mind that the foregoing statements refer to substantive legislation which contains authorizations to begin certain studies or undertake specific programs. In order to carry out such legislation and authorizations, funds must be requested and appropriated. Funds are requested by submitting formal appropriation estimates and by appearing before subcommittees of the Appropriations Committee. The Appropriations Committee in both the House and the Senate is very important and very powerful.

No attempt has been made to give here a listing of all Senators or Congressmen who have handled legislation affecting the Public Health Service. Only a few important legislative milestones have been noted. Members of both Houses of Congress usually are able, intelligent individuals who, to the best of their abilities, serve the nation and represent their districts. Actions of members may be swayed by local or national political interests, and occasionally by special groups or by personal interests. A member of Congress generally represents the will of the majority of the people of his constituency. Sometimes, through political accident, incompetent men may be elected to Congress but seldom do they remain long in office.

The average member of Congress has fought his way to membership in that body by reason of ability and force of personality. Few persons attain the honor of serving in Congress without possessing some unusual qualities that have enabled them to win the election. Through the 152 years since the establishment of the Service, Congress usually has acted to meet the health needs of the nation within the existing scientific knowledge at a given period, although at times it has seemed to public health workers that the interest of Congress in health did lag notably. This undoubtedly was due to the fact that the people whom Congress represented had not become sufficiently concerned with health matters. Within recent years expanding interest in and support for public health work have been manifested by the Congress.

CHAPTER IV

Public Health Laboratory Research*

Each new grain of truth
is packed, like radium, with whole
worlds of light.—ALFRED NOYES

The Early Years

IN THE last half of the 19th century, epidemic diseases were one of the most pressing problems dealt with by the Marine Hospital Service. Physicians had the dual responsibility of caring for seriously ill seamen and preventing the spread of their illnesses, if communicable, to the surrounding community.

Cholera, smallpox, yellow fever, and later bubonic plague were constant, frightening national hazards. Every ship tying up in American waters from foreign ports brought with her the possibility of infection from the crew, passengers, and the ever present rats. Infectious diseases were still a scientific mystery. But there was a new, highly promising approach growing out of the work of a French chemist named Louis Pasteur. As a result of his demonstrations, a new branch of science called bacteriology was taking hold in Europe and being rapidly developed by many able persons.

In the 1880's a young medical officer of the Marine Hospital Service, Dr. Joseph J. Kinyoun, made a study tour of the European scientific research centers. He met the great men of the day: Koch, Ehrlich, Roux, and von Behring. He watched demonstrations of a miraculous

*Throughout this section and elsewhere, the principal research laboratory of the Public Health Service is referred to as the Hygienic Laboratory, the National Institute of Health, and the National Institutes of Health. The name Hygienic Laboratory was changed to the National Institute of Health in 1930 and, with the creation of other research units in 1948, to the National Institutes of Health.

(From USPHS Records)

Staff, U. S. Marine Hospital and Hygienic Laboratory, Stapleton, Staten Island, New York, 1888. In the center of the photograph is Surgeon Walter Wyman, later Surgeon General.

(From USPHS Records)

Advisory Council, Hygienic Laboratory, May 1906, and personnel of the Hygienic Laboratory.

1st ROW (left to right): Drs. John F. Urie, U. S. Navy; Milton J. Rosenau, Director, Hygienic Laboratory; William H. Welch, Johns Hopkins University; Surgeon General Walter Wyman; Drs. Victor C. Vaughan, University of Michigan; Frank E. Westbrook, University of Minnesota; A. D. Melvin, Chief, Bureau of Animal Industry, Department of Agriculture, 2nd ROW: Drs. William T. Sedgwick, Massachusetts Institute of Technology; Reid Hunt, Chief, Division of Pharmacology; John F. Anderson, Assistant Director, Hygienic Laboratory; Major Walter D. McCaw, U. S. Army; Drs. Charles Wardell Stiles, Chief, Division of Zoology; Joseph H. Kastle, Chief, Division of Chemistry; John W. Kerr. 3rd ROW: Laboratory Attendant William Lindgren; Stenographer E. B. K. Foltz; Clerk David G. Willets; Pharmacist F. J. Herty; Dr. Joseph Goldberger.

new method of controlling infectious diseases. He returned to the United States, fired with a determination to make his new knowledge contribute to improved public health in this country.

In one room of the Marine Hospital on Staten Island, New York, Doctor Kinyoun in August of 1887, set up what was probably one of the first bacteriological laboratories in the United States. He gathered together experimental equipment and a microscope, equipped with Zeiss lenses, modeled after the one used by Doctor Koch.

The young doctor began at once to study cholera and other diseases, applying what he had learned in France and Germany. During his first year at work, he isolated the cholera organism from passengers arriving on two steamships in the Port of New York. Colleagues were able to see for the first time the tiny, living organisms which caused this dreaded disease.

THE FIRST LABORATORY

Officially, Doctor Kinyoun's single-room establishment was called a "Laboratory of Hygiene," and he was made its director. This tiny laboratory in Staten Island's hospital for sick and disabled sailors was the beginning (1887) of medical laboratory research in the Public Health Service. It was the embryo of the largest medical-research organization in the world—the presently (1950) constituted National Institutes of Health.

Today, the seven Institutes that make up the National Institutes of Health occupy nine buildings on a rolling, wooded tract in Bethesda, Maryland, containing more than three hundred acres which its workers once called "ninety acres of science." Scientists go about their daily tasks seeking answers to every type of problem which affects man's health: nutrition, the maintenance of physical vitality and good mental health; cancer; heart disease; infectious diseases; tooth decay; tropical diseases; and the chronic diseases of age. As many as 250 separate studies may be going on at one time.

THE FIRST DIRECTOR

The Hygienic Laboratory's first director, Dr. Joseph J. Kinyoun, predicted that "the scope of work of this character is constantly widening, its utility unquestionable."

Doctor Kinyoun thought beyond the furnishing of services to a single hospital. He hoped for official recognition of research as a function of the entire Service. He believed laboratory investigation should be supplied to all branches of the Marine Hospital Service.

Dr. Walter Wyman (later Surgeon General), who was then in charge of the hospital at Staten Island, gave Doctor Kinyoun strong support in his work. In 1891 after becoming Surgeon General, Doctor Wyman secured authorization for the establishment of the Hygienic Laboratory as an official entity. In June of that year, the Laboratory was moved to the top floor of the Butler Building on Capitol Hill in Washington, which had just become the headquarters building of the Marine Hospital Service.

The pattern of research activity established in those early days has remained largely the same to this time (1950). Investigations dealt with problems encountered by the Service. Foreign and interstate quarantine, for example, demanded expert, first-hand information on the causes, sources, modes of spread, and means for diagnosis and prevention of quarantinable and major communicable diseases.

Doctor Kinyoun soon became familiar with the organisms of cholera, tuberculosis, typhoid fever, pneumonia, anthrax, suppuration, and the parasite of malaria. He experimented on disinfectants to be used in quarantine work, early demonstrating the advantage of sulphur dioxide over the other gases used in fumigation.

The Laboratory Director again went to Europe in 1891, taking courses under Koch, whose tuberculin, still of unrevealed composition, was being tried out on crowds of consumptives flocking to Berlin on news of a "cure." Doctor Kinyoun, interested but conservative, commented that it was evident from the first that the new agent was capable of doing great harm as well as good. He saw much of the bacteriological work going on at that time in Berlin, later studying rabies at the Pasteur Institute in Paris and listening to Metchnikoff on phagocytosis. He came back to the United States full of ideas which were reflected in his work and subsequent policy suggestions for the Service, many of them successfully carried out by his successors.

A fellow scientist of the Service who followed Doctor Kinyoun some years later, Dr. Arthur M. Stimson, characterized him as "solid, de-

pendable and industrious in bacteriology," with broad vision in public health operations. Doctor Kinyoun had great practical sense.

FURTHER STUDIES IN EUROPE

In 1894 he went back to Berlin and Paris to study diphtheria antitoxin. His report in October of that year to Surgeon General Wyman records the impact of bacteriology on a disease-plagued world and gives a clue to the personality of Doctor Kinyoun.

> The results obtained by Professor E. M. Roux of the Pasteur Institute in the treatment of cases of diphtheria are so astounding that at first one is almost compelled to ask oneself, "Is this possible?" But when the methods are known and the array of statistics are given, there can hardly remain a trace of doubt. . . . It appears that at last we have found a method which is not only good in one disease, but the principle of the method can be applied to many. It at last has opened up a new field for work in infectious diseases.

After several months studying the new treatment at the Pasteur Institute, Doctor Kinyoun concluded "it has passed the experimental stage and will in the future be reckoned in value for the treatment of diphtheria, as vaccine is for the prevention of smallpox."

While at the Pasteur Institute, Doctor Kinyoun learned the three necessary steps in preparation of diphtheria antitoxin: The preparation of diphtheria toxins; the immunization of animals; and the preparation and conservation of antiserum. When he came back home he prepared and distributed the antitoxin at the Hygienic Laboratory, being one of the first to make and standardize it in the United States.

He then went to Berlin to study the diphtheria work being carried on by Professors Wassermann and Ehrlich in the Institute for Infectious Diseases.

Summing up his observations in Paris and Berlin, Doctor Kinyoun wrote:

> The antitoxin will never work miracles; it has its limits like any other agent, and like a perfect piece of machinery will not accomplish the full result unless directed by a skilled hand. Some persons affected with this dread disease will succumb, it matters not how soon we apply the remedy. The majority will, however, I am sure, recover if the antitoxin is given early and properly.
>
> The remedy should be satisfactory to the medical profession . . . It is to be hoped that soon every state and municipality will take the proper steps to provide facilities

to supply the remedy to the people, and by a judicious and timely use be able to stamp out this terrible scourge, which carries off so many thousands, rendering desolate so many homes.

In this report, Doctor Kinyoun demonstrated his great breadth of vision in public health matters. He did not stop with appreciation of this laboratory marvel. His mind immediately jumped ahead to a practical consideration: What would happen when popular demand made this new antitoxin a mass treatment tool? This product, made from death-dealing bacteria, was a potent therapeutic agent.

BIOLOGICS STANDARDS FORESEEN

Doctor Kinyoun made this farsighted observation:

Many persons will, during the ensuing year, commence to prepare the serum as a business enterprise, and there will, without doubt, be many worthless articles called antitoxin thrown upon the market. All the serum intended for sale should be made or tested by competent persons. The testing, in fact, should be done by disinterested parties. The danger with us is perhaps greater than could exist here [in Germany] under any circumstances.

This was Doctor Kinyoun's first plea for the establishment of a regulatory service, which would guarantee the safety and effectiveness of the strange, new bacteriological weapons. But it was not until 1902 (a year after 10 St. Louis children had died from effects of a tetanus-tainted diphtheria antitoxin) that Congress passed the Biologics Control Act. This fulfilled Doctor Kinyoun's hopes and gave the American public safeguards in the use of the new antitoxin, and the lengthy parade of serums, vaccines, and similar products which has followed.

A separate Biologics Control Division was established in the Hygienic Laboratory to conduct essential research and administer the regulatory provisions of the Act. Three years before the Biologics Control Act was passed, Doctor Kinyoun had been transferred to quarantine duty in San Francisco. But before he turned over the directorship of the Hygienic Laboratory to Dr. Milton J. Rosenau, he had left many marks of his careful thinking relative to the new science of bacteriology.

Doctor Kinyoun produced diphtheria antitoxin in the United States on his return from Europe in 1894, and was among the pioneers in its introduction into this country. He urged the examination and purifi-

cation of public water supplies, the maintenance of a graduate school in public health laboratory methods, the sanitation of common carriers, the modernization of quarantine equipment, and the determination of the usefulness of disinfectants. Doctor Kinyoun was an early defender of animal experimentation, and recognized that better work could be done by the Hygienic Laboratory if it were separated into different administrative divisions.

ROSENAU BECOMES DIRECTOR

When Dr. Milton J. Rosenau succeeded Doctor Kinyoun in 1899 (to remain in this post until 1909) the Hygienic Laboratory entered a second phase of expansion. What had begun as a one-room laboratory expanded into a research organization with separate divisions of chemistry, bacteriology and pathology, zoology, and pharmacology. In 1901 Congress appropriated the sum of $35,000 for "a laboratory for the investigation of infectious and contagious diseases and matters pertaining to the public health." Two years later the laboratory moved to its own building on a five-acre site near the western end of E Street, N.W., at 25th Street in Washington, D. C.

Doctor Rosenau was one of the leaders in the field of public health. Not only was he an able planner and administrator, but he was an original thinker and research scientist. With Dr. John F. Anderson, he pioneered in the study of anaphylaxis. He modified and improved the standard diphtheria toxin used by manufacturers in preparing diphtheria antitoxin, and he devised the standard tetanus toxin for like use in the preparation of tetanus antitoxin. His milk bacteria studies were of fundamental importance in making safe milk available to the American people. Before he took over the Hygienic Laboratory he was personally credited with organization of the quarantine services at Santiago and other Cuban ports in 1898-99.

Probably Doctor Rosenau's major enduring contribution was a comprehensive textbook on public health, published in 1913. It remains a standard text in public health schools. In it Doctor Rosenau summed up the knowledge he had acquired in 23 years as a quarantine officer, in epidemics, in epidemiological investigations, and in public health laboratories at home and abroad.

WORK OF LABORATORY ENLARGED

It was during Doctor Rosenau's administration of the Hygienic Laboratory that American research on communicable diseases moved ahead with gigantic strides.

The reorganization Act of 1902 gave authority to the Public Health and Marine Hospital Service to strengthen and expand the operations of the Hygienic Laboratory. This Act established an advisory board of "competent experts" representing the Army, the Navy, and the Department of Agriculture's Bureau of Animal Industry, and five non-governmental members "skilled in laboratory work in its relation to the public health."

The Act also provided that if no commissioned medical officers were available, the Public Health Service could employ "competent persons to take charge of the divisions of chemistry, zoology, and pharmacology."

Biologics Control

Through the Hygienic Laboratory, control was exercised over the biologic products sold in interstate commerce whether produced in the United States or imported. All such products were required to conform to the standards of purity, safety, and potency established by the Service under the Biologics Control Act. The control system is essentially the same today as it was in 1902.

Enforcement of the Biologics Control Law is handled through a licensing system, under which samples of manufacturers' vaccines, serums, and other products must pass a series of rigorous laboratory tests as to purity and potency. The commercial manufacturing biologics laboratories are inspected at regular intervals; their processes, equipment, materials, and methods are carefully scrutinized.

The almost 50 years of association of the Public Health Service biologics control specialists with commercial manufacturers of biologic products has been marked by a friendly cooperative spirit and joint progress toward better products.

In 1902 there were only three biologic products on the market: Diphtheria and tetanus antitoxins and smallpox vaccine. Today the list includes products for many infectious diseases, in addition to blood pro-

(From USPHS Records)

Dr. Arthur M. Stimson

(From USPHS Records)

Hygienic Laboratory, Washington, D. C., about 1915.

ducts and allergenic extracts. The biologics control was never intended as a policing function alone. It was set up as a research organization and has always remained so. In their efforts to improve biologic products and to find new immunizing agents for disease, its workers have made major contributions to scientific knowledge.

One of the first steps in 1902 under the new Biologics Control Act was the establishment of an American standard of potency for diphtheria antitoxin adopted from Germany. The Laboratory's scientists brought considerable first-hand experience to bear on this product. Doctor Kinyoun was one of the first to witness its preparation in Paris, and had himself repeated Doctor Roux's method at the Hygienic Laboratory. Doctor Rosenau also was familiar with the European methods.

The standardization of a potentially dangerous product as the antitoxin, required broad original research in bacteriology and serology. The first standard for antitoxin was issued to manufacturers early in 1905. Difficulties with the antitoxin have been few but the situation has demanded continuing vigilance and research for improvement of the product. The toxin-antitoxin mixture was later introduced (TAM). By 1930 the toxin-antitoxin mixture was replaced with the more effective diphtheria toxoid for active immunization. The American standard for tetanus toxin was developed entirely at the Hygienic Laboratory, and became the world standard for the testing of tetanus antitoxin.

SMALLPOX VACCINATION

In the early part of the century smallpox vaccination was not the safe procedure it is today. Too often, the patients had serious, sometimes fatal, infections. Occasionally, vaccinated individuals would develop tetanus or encephalitis.

The enormous improvement in vaccination techniques in this country is due largely to the unceasing efforts of the Public Health Service. Based on its own broad research, and with authority granted by the Biologics Control Act, the Hygienic Laboratory has year by year improved the quality of preventive and therapeutic biologics.

The Laboratory found three factors which contributed to serious infection in smallpox vaccination.

(1) The use of points and unripened glycerin tubes, which harbored harmful bacteria. Doctor Rosenau demonstrated this in 1902. With passage of the Biologics Control Act, manufacturing processes were so carefully supervised that this situation promptly improved.

(2) The practice of making unnecessary large and deep scarifications in vaccinating.

(3) The practice of applying any dressings at the vaccination site.

The cases of post-vaccinal tetanus and encephalitis were investigated by medical officers from the Laboratory. Between 1902 and 1915, enough vaccine to vaccinate 2,000,000 people was examined for the presence of tetanus by the Hygienic Laboratory, with entirely negative results.

However, tetanus spores were found in the materials used for dressings. Dr. John F. Anderson found them in commercial gelatin in 1902; Dr. George W. McCoy, Dr. James P. Leake, and Hugh B. Corbitt, in court plaster in 1917; Doctor McCoy and Ida A. Bengtson on some vaccine point scarifiers in 1917; Dr. Charles Armstrong in bunion pads in 1925.

In 1921, as a result of the Laboratory's investigations, the Public Health Service recommended minimal insertions in vaccinations; and the abandonment of dressings other than possibly a piece of sterile gauze pinned to the inside of the sleeve. Direct dressings, even if sterile, were shown by Doctor Armstrong to promote conditions without which tetanus would not develop. With the abandonment of dressings post vaccination tetanus has disappeared.

The Service adopted the rabbit method of testing smallpox vaccine potency about this time. An important contribution to smallpox vaccination was the multiple pressure method of vaccination (1921) of Dr. James P. Leake of the Service and Dr. John N. Force of California. This method reduced reactions and scars encountered with scarification method and increased the percentage of "takes." "Questions and Answers on Smallpox Vaccination" by Dr. James P. Leake is still the most authoritative practice manual on vaccination in existence.

The Hygienic Laboratory carried on several studies showing the effect of certain substances when mixed with vaccine virus. It was shown

that diphtheria toxoid when so mixed had the effect of reducing both the local and general response in rabbits, and that when previously administered in two doses to mice, it afforded some resistence to intracerebral injections of vaccine virus.

These studies resulted in a practical piece of knowledge. On the basis of results, it was advised, in 1932, that children should first be immunized against diphtheria and about a month later, vaccinated against smallpox.

Not the least of the services rendered by the Biologics Control Laboratory is its protection of the public against unproven "cures." Unless the originator of the new product or method could offer sound scientific proof of his claims, the Laboratory, sometimes against strong pressures, refused to recommend the granting of a license.

Rabies

Although comparatively rare, from ancient times rabies has been one of man's most terrifying diseases. Because of its unusual method of transmission, its long incubation period, the extreme suffering of its victims, and the uniformly fatal end, rabies ranks far ahead of many other prevalent diseases in scientific interest.

Until Pasteur developed his preventive inoculations, there had been no method of controlling rabies. In the United States, in 1906, there were several so-called Pasteur Institutes, managed by men who had studied at the original Paris Institute. These were the only places in the country where the preventive vaccine could be obtained. Since these institutes were few in number and widely separated, individuals bitten by rabid dogs usually would have to travel hundreds of miles for treatment. The prohibitive cost and distance often made treatment impossible and resulted in many unnecessary deaths.

The Public Health Service stepped into the picture at this time. Doctor Rosenau placed Dr. Arthur M. Stimson in charge of the work. After reviewing all existing literature on rabies, Doctor Stimson developed a treatment based on Pasteur's original method. Beginning in April 1908, this was administered to anyone who applied at the Laboratory.

To make treatment possible to people in all parts of the country, Doctor Stimson evolved a method of preserving glycerinated spinal

cords of rabbits. The material was then shipped to State health laboratories where it could be made into preventive vaccine. This practice continued until 1921 when several commercial biologics manufacturers began turning out the vaccine.

An important adjunct to rabies work done by the Laboratory was two surveys on the prevalence of rabies in man and animals in the United States, conducted in 1908 and 1911. Dr. John W. Kerr and Doctor Stimson made the first survey and Doctor Stimson alone, the second. Human deaths from rabies were found to number around 100 annually, while deaths in dogs and livestock ran into the thousands.

During administration of the vaccine to patients at the Laboratory, Doctor Stimson observed for the first time a skin eruption at the inoculation site, which was apparently an allergic phenomenon. Several cases of paralysis resulting from use of the Pasteur preventive treatment itself also were noted. These initial observations were the basis for research carried on 30 years later at the National Institute of Health, which has resulted in markedly improved rabies treatment. The early rabies vaccines were unpredictable in results. One of the greatest needs was a method of standardizing their effectiveness.

In 1940, Dr. Karl Habel worked out a laboratory animal test which established a workable standard for potency of the vaccine. He later worked on a further improvement, using ultra-violet irradiation instead of phenol, to kill the rabies virus in the vaccine. The most important improvement in the vaccine, however, was the removal of the paralytic factor. In one out of about every 5,000 cases, the individual vaccinated for rabies developed paralytic symptoms, as Doctor Stimson had noted earlier.

Drs. Joseph A. Bell, Karl Habel, and John T. Wright confirmed that the paralysis was due to the introduction of foreign brain tissue into the system. (The vaccine is made from rabbit brains.) They were able to isolate and remove the paralytic factor in the brain tissue and eliminate it from the vaccine.

Workers at the National Institutes of Health also have produced a rabies serum which, used to back up the effects of the vaccine, offers double protection against the disease.

Anaphylaxis

Two phenomena of incalculable importance in modern medicine, shock and allergic reaction, were virtually unknown in 1900. Surgical shock had been observed, but its cause was not understood.

The recognition of this remarkable body process, anaphylaxis, came about in an attempt to find out why some people reacted violently, and a few died, when they were given diphtheria antitoxin.

Drs. Milton J. Rosenau, John F. Anderson, and Wade H. Frost worked on this problem. They had the ability to recognize the over-all significance of the complex body reactions which unfolded before them, aside from providing an answer to their immediate problem. At the time they began work, an occasional death from the use of immunizing serums was a problem of major proportions. The future use of biologic products to immunize against several diseases rested on their ability to find out why these deaths occurred.

In addition to the handful of fatalities which occurred shortly after injection, a number of people given diphtheria or tetanus antitoxin (prepared with horse serum) reacted with serious, later appearing symptoms. They experienced respiratory difficulties, joint pains, fever, and skin eruptions.

The most natural conclusion was to fix the blame on the diphtheria antitoxin itself, which was made from recognizably dangerous bacilli. But by 1906 Doctor Rosenau and Doctor Anderson established that

> . . . diphtheria antitoxin . . . has nothing whatever to do with the poisonous action of horse serum; further, that diphtheria antitoxin in itself is absolutely harmless. The toxic action which we have studied is caused by a principle in normal horse serum and is entirely independent of the antitoxic properties of the serum. (*Journal of Medical Research,* Vol. XV, No. 1, pp. 179-208.)

The manufacturers of diphtheria antitoxin previously had observed a curious phenomenon in the preparation of their product: The injection of horse serum into normal guinea pigs caused no reaction at all. But if the same dose were given to guinea pigs that had already recovered from an injection of diphtheria antitoxin, the story was reversed. Doctor Anderson thought a study of this unexpected reaction in guinea pigs might throw light on the cause of human fatalities. An extensive laboratory

study was set up to determine what actually happens when horse serum is injected into guinea pigs. As a result of this work, the Hygienic Laboratory workers developed the first sound theory ever advanced on the matter of personal sensitivity. Nicolle of the Pasteur Institute arrived at similar conclusions at about the same time.

In reporting his work to the American Association of Pathologists and Bacteriologists in Baltimore in May 1907, Doctor Rosenau stated:

> We have shown that ordinarily horse serum is a comparatively bland and harmless substance but certain animals may be rendered so susceptible that an injection of it may produce sudden death or severe symptoms . . .
>
> The first injection of horse serum has sensitized the animal in such a way as to render it very susceptible. It is probable that when the guinea pig is injected with the first, or sensitizing quantity of serum, the strange proteid contained in the horse serum develops in the body of the guinea pig "anti-bodies" which, when brought into contact with more horse serum given at a second injection, cause the toxic action.
>
> A certain time is necessary to elapse between the first and second injection of horse serum before this toxic action is able to manifest itself. This "period of incubation" is about 10 days.

Doctors Rosenau and Anderson erroneously concluded that the poisonous principle in the horse serum apparently acted on the respiratory centers, since the heart continued to beat long after respiration ceased.

In their work with guinea pigs, the Hygienic Laboratory investigators called attention to circumstances which are the basis of our present knowledge of allergies. They discovered that guinea pigs could be sensitized to the horse serum simply by feeding them horse meat. Doctor Rosenau wrote:

> If man can be sensitized in a similar way by the eating of certain proteid substances, may not this throw light upon those interesting and obscure idiosyncrasies in which the eating of fish, sea food, and other articles of diet habitually cause sudden and serious symptoms?

The investigators also found that active immunity against this toxic principle could readily be established in guinea pigs by repeated injections of horse serum at short intervals. Modern treatment of allergies has now progressed a great deal beyond this early observation by Doctor Rosenau.

We believe that the substance which sensitizes the animal is identical with that which later poisons it. However, the substance must first cause a reaction in the organism resulting in a production of anti-bodies. We have found that small quantities of horse serum produce, after a definite period of incubation, a condition of anaphylaxis; multiple or repeated injections produce immunity.

Doctor Rosenau and Doctor Anderson had observed that the phenomenon of hypersusceptibility to proteid substances in bacteria was followed by definite immunity against infection by the same organism. They were convinced that this state of affairs had an important bearing on the prevention and cure of infectious diseases.

This was a time when infectious diseases still were medicine's greatest problem. It was natural that these two scientists thought first about applying their findings on anaphylaxis to communicable disease control. But they were men of broad vision. They realized that the phenomenon they called anaphylaxis had an important bearing on many fundamental problems in medicine. And it was knowledge of specific value to individuals who suffered from certain previously unexplained ailments.

By 1909 Doctor Rosenau and Doctor Anderson were able to say definitely that "diseases like hay fever find their explanation in a specific hypersusceptibility." They had concluded that severe reactions to eating certain foods had the same basis of personal hypersusceptibility.

In 1910, Doctor Anderson, with Dr. Wade H. Frost, summed up the results of the Hygienic Laboratory's work on anaphylaxis. The word "allergen" here enters medical literature.

Normally, proteins taken into the body by mouth are split up into simpler compounds by digestive juices in the stomach, and the simpler compounds forwarded to the body tissues for assimilation. But when whole proteins get into general circulation within the body, the cells cannot assimilate them easily. The body instead forms "anti-bodies" to take care of the whole protein (as it forms anti-bodies against disease organisms.)

Doctors Anderson and Frost concluded that anaphylactic shock is due to "a disturbance of metabolic equilibrium" due to a temporary deflection of the cells' normal activity, rather than to toxic action. (Transactions of the Congress of American Physicians and Surgeons, 1910, Vol. VIII.)

In the first decade of the twentieth century, these scientists of the still young Hygienic Laboratory had elucidated a new area of man's ailments, the allergies, and had given medical science fundamental knowledge toward conquest of the frightening mystery of serum shock.

Tularemia

Scientific research rarely gathers together all the answers to a given problem at one time. A scientist may discover the cause of a disease and still be unable to find a cure. Or, he may have a preventive, as in the case of smallpox vaccination, long before he understands the disease itself. The complete conquest of a disease is usually the result of the combined effort of many workers in different countries laboring over a long period of time, sometimes centuries.

Tularemia is an outstanding instance in which American investigators have discovered a new infectious disease of man, isolated its causative agent, and determined the sources of infection and methods of transmission to man. The major credit belongs to the early workers of the Public Health Service, and especially to Dr. Edward Francis. According to the late Dr. Victor C. Vaughan of the University of Michigan, tularemia is "a disease discovered by the U. S. Public Health Service." Japanese and Russian workers have made some contributions to existing knowledge of tularemia. In 1910 the Public Health Service was on the alert to suppress the incidence of plague on the West Coast. An important part of this work was the routine examination of thousands of wild rodents trapped or shot in various counties of California and brought into the San Francisco Plague Laboratory for examination for evidence of plague.

Dr. George W. McCoy, who was in charge of this work, was puzzled by the inconsistencies of lesions found in some of the ground squirrels, coming particularly from Tulare County. Their lesions looked like those of plague, but the plague bacillus could not be demonstrated microscopically in them, nor could it be made to grow on plain agar culture medium inoculated with their tissues; and yet guinea pigs inoculated with those same suspected squirrel tissues showed plague-like lesions and subsequently died from the effects of the inoculation. But still no plague bacilli could be found in stained tissue smears.

Doctor McCoy realized he was dealing with a new organism. He demonstrated that this new organism caused a "plague-like disease" in rodents and in monkeys, that it would not grow on plain agar culture medium, and that it could be transmitted feebly by fleas. After working on the problem for a year, Doctors McCoy and Charles W. Chapin were able to isolate the new organism and grow it on coagulated hen's egg yolk. They called it *Bacterium tularense,* because the first ground squirrels in which the disease was first recognized came from Tulare County, California.

The two scientists thought it likely that human beings would be susceptible to *Bacterium tularense,* and they had serological proof of it in the blood of two of their laboratory workers. The matter thus rested as an interesting infection of wild rodents, likely to be confused with plague, unless one were on the lookout for it, until 1915. Then a University of Cincinnati worker, Dr. William B. Wherry who, as an officer of the Service, had worked with Doctor McCoy in California, found *Bacterium tularense* in two human cases of infection of the eye (ulcerative conjuctivitis) and in two wild rabbits. He issued a warning on the danger of handling wild rabbits.

In 1919, the Public Health Service answered a call for help from the Utah State Health Department which was trying to cope with a local epidemic of "deer fly fever" or "Pahvant Valley plague." This disease, common in that area since 1910, and described by Dr. R. A. Pearse of Utah in 1911, was an especially serious problem among the farmers. The Service sent Dr. Edward Francis of the Hygienic Laboratory to Utah to investigate the problem.

The day he arrived in Delta, Utah, from Washington, Doctor Francis visited a rancher suffering from "deer fly fever." He drew blood samples from the patient on several occasions, and later when the patient died performed an autopsy. Blood and spleen tissue were inoculated into laboratory animals. The animals died. On examination, Doctor Francis recognized in them the same lesions Doctor McCoy had described in California in his "plague-like disease of rodents."

Doctor Francis' matching up of laboratory evidence gave us a new disease of man—tularemia. Later, it was shown that tularemia is present in 12 countries throughout the world.

In later experimental work extending into the next decade, Doctor Francis and other investigators delineated the method of human transmission through the bite of deer flies which receive the organism from diseased wild rabbits. Proof of transmission by a variety of arthropods, especially ticks, was a major contribution by the Service. Direct transmission, from rabbit to man, was found to occur when the internal organs of diseased rabbits are handled.

Bacterium tularense proved to be a highly infectious organism. Nobody knew this better than Dr. Edward Francis, who contracted tularemia from the first "deer fly fever" patient he visited in Utah. Doctor Francis, sick for three months, kept a careful record of his illness. His illness hampered his work at the time, but it had important long-range results. From it he discovered that one attack of tularemia in man confers permanent immunity. From May 1920 to 1936, Doctor Francis was continuously exposed to high concentrations of *Bacterium tularense.* On four occasions he accidentally reinfected himself, proving conclusively that local reinfection in a tularemia-immune individual is an immune reaction, as in revaccination with smallpox vaccine virus.

In the next 10 years Doctor Francis continued important investigations on tularemia. His work led to the development of proper precautionary measures for handling and cooking wild rabbits. The investigation of a family living in Lee County, Virginia, in 1926, three of whom died from eating insufficiently cooked wild rabbit, clearly indicated the necessity for cooking wild rabbit meat until well done. The discovery of tularemia among rabbits sold in the markets led to better methods of handling and refrigeration.

Doctor Francis played the leading role in the investigation of tularemia. His acquaintance with the earlier work of Doctor McCoy on "the plague-like disease of rodents" was the key to the problem. It illustrates the importance of following through on a "routine" problem that fails to give the expected immediate results, whether or not there is hope of practical application. Elucidated principally by American investigators, now prevalent in practically all of the States, and on three other continents, tularemia has become a world-recognized disease of man and has taken its place in the medical literature of every civilized country.

(From USPHS Records)

Dr. Edward Francis

(From USPHS Records)

Dr. Roscoe R. Spencer

Rocky Mountain Spotted Fever

In 1902 the State of Montana faced a menacing health problem. Every spring for 10 years, when the sheep herders and stockmen went up into the hills with their animals, a score would come down with a mysterious disease. Few survived. Natives called the unknown ailment the "black measles" and thought it probably had something to do with drinking melted snow water. It had been observed among the State's early settlers in 1872, and there is evidence it was prevalent among the Indians.*

In 1902, a year in which spotted fever was taking a devastating toll, the recently created Montana State Board of Health invited Dr. Louis B. Wilson and Dr. W. M. Chowning of the University of Minnesota to make a study. At the same time the Public Health and Marine Hospital Service sent Dr. Julius O. Cobb to investigate the situation.

The scientists at once saw there were a number of peculiar things about this disease. In the Bitter Root Valley of Montana, the mortality rate was 80 to 90 percent in adults, while in neighboring Idaho, the same disease had a considerably lower fatality rate. Further, the fever was far more prevalent on one side of the river running through the valley than on the other side of the stream. The reason for this disparity has not been made clear, although ticks are prevalent on both sides. This disease was something like typhus fever and had a marked seasonal prevalence during the spring and early summer.

THE SERVICE BEGINS SPOTTED FEVER STUDIES

Doctor Cobb's arrival in the Bitter Root Valley was the beginning of the Hygienic Laboratory's more than 40-year association with spotted fever (and later with other rickettsial diseases). The relationship was one of the bright chapters in the Laboratory's continuous duel with disease. Scientists, outside and in the Service, working through the years, amassed volumes of valuable information which resulted in the proof of tick transmission and the development of a protective vaccine for spotted fever.

*In the 1930's "spotted fever" was recognized in almost all areas of the United States, among picnickers, children who played in the woods, and families with pets. Transmitted by ticks, the disease is known to exist in all but four States.

In the course of the investigation, five men sacrificed their lives. Three of them, Dr. Thomas B. McClintic, William E. Gittinger, and LeRoy Arthur Kerlee, who died from spotted fever contracted during experimental work, were Public Health Service men. There was one common factor among the spotted fever fatalities observed by the first scientists to arrive in the Bitter Root Valley. Most of the men, women, and children who died had been bitten by ticks. The tick immediately became the chief suspect as the disease carrier.

Scientific investigation is, by its nature, a painfully slow process. The investigations of spotted fever appeared to progress at a snail's pace during the first 20 years of work when more and more ranchers died from the disease apparently carried by the tick. But in these 20 years the fundamental knowledge necessary eventually to control the disease was gradually assembled. In this period dozens of Hygienic Laboratory scientists made inconclusive but significant contributions. Dr. John F. Anderson, who took up the work in 1903, was inclined to accept the tick hypothesis. He compiled a report of all cases since 1885 and contributed a valuable summary of all that was then known about the disease. Dr. Charles Wardell Stiles of the Service was on the scene in 1904. The western wood tick *Dermacentor andersoni* was described by Doctor Stiles in 1908 and named in honor of Dr. John F. Anderson.

Two years later, Dr. Walter W. King produced spotted fever in a guinea pig by feeding an infected tick upon it. He also produced the disease in laboratory animals by injecting them with the blood of spotted fever patients. Doctor King's work was done the same year as that of the memorable contributions of Dr. Howard T. Ricketts of the University of Chicago, from whom he had received his infected ticks. Doctor Ricketts proved conclusively that the tick was the transmitting agent and subsequently suggested control measures.

In 1911 Dr. Thomas B. McClintic of the Service was sent to Victor, Montana, to set up a control program, dipping livestock and exterminating ground squirrels. Almost at the end of his first season's work, he contracted spotted fever. Doctor McClintic had been preparing to return to Washington. Seriously ill, he nevertheless decided to make the trip so his colleagues would have a chance to observe spotted fever

symptoms first hand. He died 24 hours after his arrival at the hospital in Washington, the first Public Health Service martyr to the disease.

Almost immediately Doctor McClintic's job was taken over by Dr. Lunsford D. Fricks who showed in laboratory studies that the causative agent could be separated by centrifugation from blood serum. Fricks described stained forms in red blood cells of infected animals which he could not find in uninfected animals. It was not until July 1919, however, that a Harvard worker, Dr. Simon B. Wolbach, was to identify the organism causing spotted fever—the virus which Wilson and Chowning thought they had found, and which Ricketts was close to discovering.

LABORATORY ESTABLISHED AT HAMILTON, MONTANA

By 1922 a good deal of progress had been made. It was generally established that a tick, feeding on an animal host, spreads spotted fever. Much work had gone into animal and tick control measures, but many people were still dying every year. The urgent need was a vaccine to protect men from spotted fever.

At that time the Hamilton Laboratory, which had started in an abandoned woodshed, in Victor, Montana, had expanded to a two-story empty school building. The building was strategically close to tick-infested underbrush and sufficiently isolated to protect the local population. (A sign over the door warned: "Enter At Your Own Risk.")

Dr. Roscoe R. Spencer, an able scientist with broad experience in plague control, was sent from Washington by the Public Health Service in 1922 to take charge of the schoolhouse laboratory. He joined forces with Dr. Ralph R. Parker, formerly of the Montana Board of Entomology, who had joined the Public Health Service. Doctor Spencer, the scientist trained in immunology, and Doctor Parker, the entomologist, turned out to be a highly effective working team. Together, they produced the urgently needed vaccine. The first forward step came from an idea of Doctor Spencer. It was tedious work feeding ticks on guinea pigs to see if they carried the spotted fever virus. He had a better idea: "The virus is in the ticks. Why not grind them up and inject the tick tissues into guinea pigs instead of going to all the trouble of feeding the ticks on the animals?" It was a good idea, but it had unex-

pected results. When the macerated ticks were injected into guinea pigs, the animals turned out to be immune to spotted fever. In some unknown way, the tick material had provided immunity.

Spencer and Parker mulled over and decided the cause probably was the fact that the hibernating ticks were not capable of infecting their hosts until a sufficient amount of blood had been ingested to revive the virus, which apparently hibernates along with the tick. This might explain why relatively few human beings got spotted fever, since even infected ticks do not infect the host if promptly removed. Further experiments proved this to be correct. Doctor Spencer then jotted down in his notes:

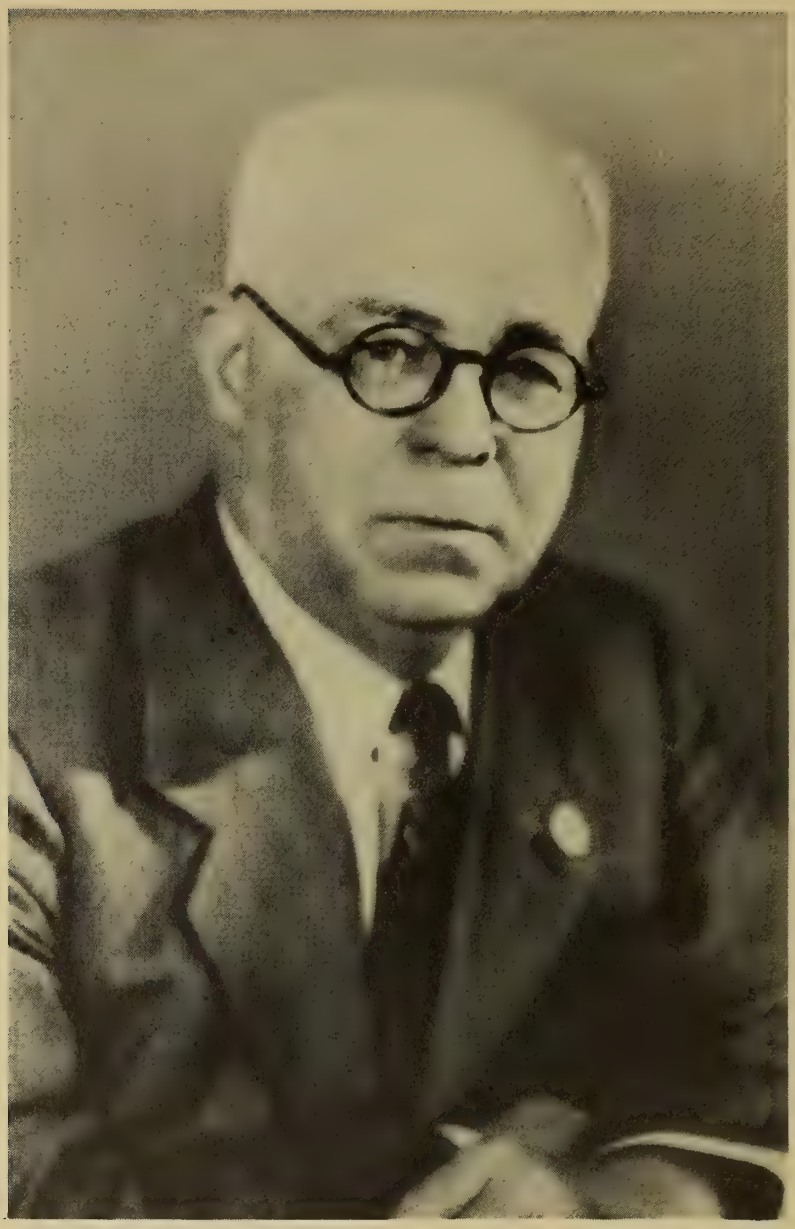
> Our experiments seem to show that when ticks first come out of hibernation, they frequently contain the virus in a phase which only produces a low-grade infection of spotted fever and that low-grade infection immunizes laboratory animals.
>
> This suggests the possibility that in some way the ingestion of blood by overwintered adult ticks results in changing the virus from a nonvirulent, immunity-producing phase to a virulent, fever-producing phase.

Doctor Spencer then knew that a practical vaccine was possible.

Soon after Spencer and Parker had absorbed this new knowledge, a tragedy occurred which neither of them would forget the rest of their lives. One of their two laboratory assistants was a 22-year-old graduate of Montana State College, William Gittinger, who was interested in studying medicine. One morning Doctor Spencer noticed, with distinct misgivings, that Gittinger, while dissecting and making stain smears of the organs of infected ticks, kept rubbing a pimple on his neck. He warned his assistant but Gittinger did not think he was taking any risks. Two weeks later Spencer again watched his assistant at work and knew that the worst had happened. Gittinger was shivering and red-faced, hardly able to go on with his work. Even then, it took a day to persuade him to enter the tiny hospital over the drug store in Hamilton. He fought spotted fever up to the minute he died. Spencer and Parker spent most of their time at his bedside. For six days, he conducted one experiment after another, in delirium. Then on June 30, 1922, he died, two weeks short of his twenty-third birthday. No one who lived in the Bitter Root Valley at that time will forget young William Gittinger.

(From USPHS Records)

Rocky Mountain Laboratory, Hamilton, Montana



(From USPHS Records)

Dr. Ralph R. Parker
Director, Rocky Mountain Laboratory, 1921-1949.

In the fall of 1923 Spencer went back to Washington to continue his work at the Hygienic Laboratory where he had better facilities for vaccine study. Parker stayed in Hamilton continuing his research in nature and his experiments in the schoolhouse laboratory. The two men kept in close touch by correspondence.

An abstract of an article written by a Czechoslovakian scientist gave Doctor Spencer the clue he had been seeking. Breinl, at the University of Prague, had discovered that the intestines of lice infected with typhus fever would, when treated with carbolic acid and injected into guinea pigs, protect the animals against typhus.

Spencer asked himself: If phenolized lice could protect against typhus, why would not phenolized ticks protect against spotted fever? He at once prepared a phenolized vaccine made from 100 ticks brought East from the Bitter Root Valley. It was a tense period as Spencer watched over the first 10 guinea pigs injected with the phenolized vaccine. Would this turn out to be just another step along the way, or was this the successful end? Not one of the 10 guinea pigs came down with spotted fever on subsequent tests. It was a success. A month later, in March of 1924, Parker welcomed Spencer back to Hamilton.

THE NEW VACCINE

The vaccine still could not be regarded as absolute protection for man. It had only protected guinea pigs. There were still long months of experimental work ahead testing it on more and more animals, and finally human beings.

This particular laboratory work on phenolized ticks was more dangerous than any they had performed before. Spencer decided to try out the vaccine, which he was convinced was safe and effective. He offered to give the new vaccine to all of the laboratory staff. No one accepted. He then, on May 19, 1924, gave himself one-half cc. of the vaccine subcutaneously, and three days later he asked Parker to give him a second dose of the new vaccine. Parker watched his friend apprehensively. Nothing happened. The vaccine had not even given Spencer a bad reaction. Doctor Spencer thus proved on himself it would work also on man.

The year 1924 was one of great success in the spotted fever fight, but it was also personally costly. Spencer and Parker both became seriously ill with tularemia (work on this disease had just begun at the Rocky Mountain Laboratory), and George Cowan, Parker's field assistant, who had not taken the vaccine, died of spotted fever. At this time Spencer and Parker convinced Francis that ticks also transmitted tularemia, by sending Francis pure cultures of *Bacterium tularense* isolated from ticks. Physicians of Idaho and Wyoming had long known that there were two types of tick fever, but it had never been reported by them. One type they called the "glandular tick fever" (tularemia) and the other was called the "spotted type."

In the spring of 1925, 34 residents of the Bitter Root Valley were vaccinated against spotted fever. That was the beginning of the end of the menace of "black measles."

When, in 1941, Doctor Parker published an accounting of 15 years' use of the Spencer-Parker vaccine, the results were impressive. In the old days the mortality from spotted fever in the Bitter Root Valley had ranged between 80 and 90 percent. Between 1927 and 1940 half a million people in the Rocky Mountain region were vaccinated. Of this half million only 61 developed spotted fever that was recognized, and of the 61, only three died.

The demand for the vaccine sometimes exceeded the capacity of the laboratory to produce it, but by 1940 a simplified manufacturing process was developed by Dr. Herald R. Cox of the Rocky Mountain Laboratory which made dispensing quicker and easier, and the cost of a single injection was reduced from $20.00 to $1.00, placing it within the reach of anyone who needed it.

The development of the Spencer-Parker vaccine did not terminate research in Rocky Mountain spotted fever. Further studies produced a different vaccine which is produced from embryonated eggs and is now available through regular commercial channels. Since this vaccine should not be given to persons who are sensitive or allergic to hens' eggs or to chickens, such individuals may be immunized with vaccine prepared from ticks, which is manufactured in limited quantity at the Rocky Mountain Laboratory.

In 1930, Drs. Adolph S. Rumreich and L. F. Badger found that the disease existed east of the Rockies. Working at the National Institute of Health, Dr. Norman H. Topping established that, contrary to general belief, the eastern and western varieties of Rocky Mountain spotted fever were identical. Doctor Topping also developed the first successful treatment for this disease, a hyperimmune rabbit serum which he announced in 1939. It reduced the spotted fever death rate from 25 percent to three percent, but it was expensive and has now been replaced by aureomycin and chloromycetin. For his work, Doctor Topping was awarded the Washington Academy of Sciences medal in 1945.

About 1948 biologics manufacturers began to produce spotted fever vaccine on a commercial basis. The Hamilton Laboratory no longer produces this vaccine for general distribution. With spotted fever well in hand, the Hamilton Laboratory was to go on to significant work on other insect-borne diseases. Thousands of World War II servicemen owe their lives and health to the Hamilton-produced vaccine against yellow fever.

ROCKY MOUNTAIN LABORATORY

The Rocky Mountain Laboratory is now concerned primarily with the diseases transmitted to man from lower animals. Established originally to deal with the Rocky Mountain spotted fever situation in the West, its responsibilities and programs have increased vastly during the past 20 years.

Dr. Ralph R. Parker, as an employee of the State of Montana, undertook in 1915 a study of ticks in eastern Montana in relation to spotted fever. He was transferred in 1918 to the town of Victor in the Bitter Root Valley, where he set up a laboratory. He devoted his efforts to improving and extending methods of controlling spotted fever and to learning more about factors influencing propagation of the infection in ticks. Doctor Parker was appointed as special expert in the Public Health Service in 1921 and was designated as Officer in Temporary Charge of the spotted fever laboratory. For 28 years he was either in charge of the operation of this laboratory or took a leading part in its work until his death in 1949.

Although his initial interest in the Bitter Root Valley was concerned with spotted fever, he eventually turned his attention to a wide variety of

diseases, to which he referred as "diseases of nature." He and various members of the staff at Hamilton made outstanding contributions in tularemia, particularly in regard to its occurrence in ticks, its differing manifestations in various mammalian hosts, and its natural occurrence in streams of water in the West.

Following the first isolation of the causative organism in the United States by members of the laboratory staff, Doctor Parker became interested in Q fever in 1939. Among the diseases of nature which attracted his interest was plague, recognized in Montana in 1935 as a result of work by the Rocky Mountain Laboratory. Doctor Parker and his colleagues presented the initial description of the rickettsial disease of the tick *Ambloyomma maculatum.*

Doctor Parker's life was intimately associated with the Rocky Mountain Laboratory. Perhaps nowhere do there exist better facilities for study of the diseases of nature, nor a more complete and competent staff. This activity reflects the tremendously wide scientific interest and boundless energy of Dr. Ralph R. Parker.

Relapsing Fevers

The spirochetal relapsing fevers and the several tick vectors have been a major project of Dr. Gordon E. Davis of the Rocky Mountain Laboratory, Hamilton, Montana. Soon after Weller and Graham (1930) reported that relapsing fever in Texas was tick-borne, special attention was called to the problems in other parts of the western States. As early as 1931, the Rocky Mountain Laboratory was called in consultation on cases of relapsing fever which were occurring in northern Idaho. Studies in this area, which continued for several years, definitely incriminated *Ornithodoros hermsi* as the vector (Philip and Davis, 1940). As a result of surveys for ticks of the genus *Ornithodoros* in relation to known or suspected cases of the disease, *O. turicata* was established as a vector in southwestern Kansas (1936); *O. hermsi* in Colorado, where cases had been known for years (1939); *O. hermsi* in Oregon (1941); *O. turicata* in New Mexico (1941); and *O. hermsi* in Washington (1942).

Spirochetes have been recovered from *O. parkeri,* a burrow tick, from eight of the nine States in which it has been found, but only in Cali-

fornia has this species been connected with relapsing fever in man (Davis, Wynns, and Beck, 1941).

Spirochetes have also been recovered from *O. talaje* collected in Arizona, Texas, and Kansas but not in relation to the disease in man.

It has been shown that a 100 percent specific relationship exists among the four tick vectors, *O. hermsi, O. turicata, O. parkeri,* and *O. talaje,* and their respective spirochetes. One phase of this problem has included such ticks as occupy the same biotope and therefore presumably feed on the same hosts. There are *O. turicata* and *O. talaje* in parts of the United States; *O. rudis* and *O. talaje* in parts of Central and South America; and *O. erraticus* in northern Africa. The same specificity holds.

Studies on a considerable number of exotic species of ticks and their spirochetes have been made in relation to domestic tick vectors. This has entailed the exchange of material with many countries, including Morocco, the Union of South Africa, Kenya, the Belgian Congo, Northern Rhodesia, France, Spain, Iran, Israel, India, Panama, Ecuador, Colombia, Argentina, Mexico, and others. Nowhere have the international relations of world problems been better exemplified.

Much material has also been supplied to universities in the United States for teaching and for research.

Many experiments have been performed on the quantitative transovarial transmission of spirochetes in both domestic and foreign species. These studies have been in relation to the relative importance of the mammalian host and the tick itself as spirochetal reservoirs.

In 1942, Dr. Edward Francis of the National Institute of Health reported the survival of *O. turicata* for 10 years and the survival of spirochetes in a virulent form for six and one-half years within naturally infected ticks which had undergone an initial starvation period of four years, and a second period of starvation of two and one-half years. At the Rocky Mountain Laboratory, *O. turicata* has survived for more than 12 years, including a single starvation period of nine years.

As a result of information gained from the detailed study of the biology of these tick vectors, especially in relation to the transmission of relapsing fever spirochetes, as well as other disease agents, it has been possible to identify certain closely allied species not easily differentiated

on a morphologic basis. It has also been possible to separate two disease agents—spirochetes and spotted fever rickettsias—received in one species of tick.

Specific experimental studies on treatment of the relapsing fevers have not been made, but in the course of several laboratory infections it has been shown that these tick-borne spirochetes do not readily respond to the arsenicals or to penicillin.

Investigations of Poliomyelitis

At the time the Service conducted its investigations of poliomyelitis, the disease had attracted comparatively little study in the United States. Dr. Charles S. Caverly had investigated several outbreaks in Vermont and had first called attention to the existence of the abortive case. Flexner and Lewis had transmitted the disease in series to monkeys. Sporadic clinical reports of outbreaks were available and more detailed studies of epidemics in Massachusetts and New York had been made by State and local health agencies or committees. Dr. Hibbert W. Hill in Minnesota commenced his field studies about the same time. The disease had been separated in mortality reports only in 1909 and cases were made officially reportable in some States in 1910.

In the Scandinavian countries, however, the disease had created considerable concern and Dr. Ivan Wickman had made his brilliant observations on the Swedish epidemic of 1905. His publication dealing with this outbreak was reviewed by Dr. Wade H. Frost for the Journal Club at the Hygienic Laboratory in the winter of 1909-10. This review was amplified and published in the *Public Health Reports,* as a precis on the disease.

In the following summer the Service was requested to conduct an investigation of an outbreak in Iowa and Doctor Frost of the Hygienic Laboratory, who had become interested in the disease through his study of Wickman's report, was assigned to this duty. Many of his assignments from that date through 1916 were concerned with poliomyelitis, either in the field or in laboratory work stemming from his field experiences.

During this period the work at the Hygienic Laboratory was largely dominated by two general responsibilities. The first of these was the

control of biologic products. Carrying out this responsibility required methodical and skeptical minds and precise laboratory procedures. The second general responsibility involved field investigation—and appropriate laboratory work stemming from it—of pressing communicable disease problems facing local communities and States. The most urgent of such problems were presented to the Service because of general lack of knowledge of their etiology and control, and because State and local agencies were not staffed or equipped to attempt their solution.

The officers detailed to the Hygienic Laboratory lived and worked in an intellectual atmosphere where skepticism and precision dominated. In the field they lived with practical and pressing disease problems among population groups. Probably no other group of men has been so fortuitously situated for investigating disease in human populations.

Doctor Frost brought to the problem of poliomyelitis the keen mind which was his birthright, sharpened by the men with whom he was associated and the intellectual atmosphere which they and their responsibilities created. The value of the contributions he made in the next few years lies in his orderly collection and array of facts of human experience in testing hypotheses of poliomyelitis transmission. Though many of these hypotheses were not original with him, the stability of their establishment is in a large part due to him and some of his Service associates and successors in field investigations of poliomyelitis.

During this early period of poliomyelitis investigations the laboratory work conducted by the Service was motivated entirely by field problems. Thus, if the circumstantial evidence derived from field investigations was correct, namely that many people were infected with poliomyelitis virus and immunized, whereas only a few developed the clinical disease, then most adults should show protective antibodies to poliomyelitis in their serum. Drs. John F. Anderson and Frost tested this and were the first to show that normal adults had such neutralizing antibodies. Some field evidence suggested the possible role of paralyzed domestic animals in poliomyelitis transmission, so Drs. Arthur M. Stimson and James P. Leake examined for virus numerous paralyzed animals which they found in association with cases and uncovered no evidence that such animals were the source of human infection.

The most extensive field investigation of poliomyelitis by the Service was conducted in and around New York City in 1916. This outbreak was, and still remains, the most extensive outbreak in any large population in the history of the disease. Some idea of the magnitude of the problem, and the concern it caused, may be found in the report of the meeting of the State and Territorial Health Officers in that year.

The field investigations were under the direction of Dr. Claude H. Lavinder, and Dr. Charles E. Banks supervised the problems relating to interstate traffic and notification of local health officers concerning movements of persons from the epidemic area. A large field force of officers drawn from other duty was gathered for the field studies. This group was dispersed at the end of the field work and it remained for Drs. Wade H. Frost, Allen W. Freeman, and Lewis R. Thompson to work up the data gathered and write the report at Cincinnati, Ohio. This was done under the general supervision of Dr. Claude H. Lavinder. This study still remains a classic in the epidemiology of poliomyelitis.

Of the men engaged in the 1916 study only Dr. James P. Leake and Dr. Lewis R. Thompson subsequently had much to do with the field investigations of the Service. Doctor Thompson's further participation was largely in his capacity as Chief of the Division of Scientific Research, and later as Director of the National Institute of Health.

Since 1916 field investigations of poliomyelitis in the Service are largely synonymous with the name of Dr. James P. Leake. His study of the 1917 winter outbreak in Elkins, West Virginia (where associated with him were Dr. Joseph Bolton and Dr. Howard F. Smith) was the first comprehensive study of a serious outbreak occurring in the winter. In the report of this study Doctor Leake also made the first effort to determine what was the normal endemic expectancy of paralytic poliomyelitis. With the exception of the statistical analysis made by Dr. Selwyn D. Collins of data on past history of paralytic poliomyelitis, as derived from the National Health Survey, it remains today the only such estimate in this country.

Doctor Leake brought to the problem of poliomyelitis a disciplined, meticulous mind dedicated to the importance of detail. Intertwined with this were a keen clinical sense and an undeviating respect for the patient-physician relationship. Experience soon taught him what he did not al-

(From USPHS Records)

Dr. Charles Armstrong

ready sense of the problems a poliomyelitis epidemic engenders among health officers, physicians, parents, and the persons stricken. Probably no one before him or since has had as complete an understanding of the total research, administrative, and clinical problems of poliomyelitis.

These qualities were relied upon to meet the exigencies of the Service which was increasingly called upon to give moral support and concrete help to communities faced with poliomyelitis. Although the nature of these exigencies usually precluded planned scientific experiment, Doctor Leake took advantage of the extensive opportunity presented to observe the natural history of the disease in numerous widespread geographical areas. His many keen observations have contributed to and confirmed our present epidemiological concept of the disease.

While Doctor Leake's publications have not been extensive, his influence on many aspects of study and control of the disease has been tremendous. It is only recently, for example, that those most vocal in poliomyelitis have come to recognize the research and administrative importance of distinguishing between paralytic and non-paralytic disease. Doctor Leake has for many years spearheaded a crusade in this direction.

A major contribution to the laboratory study of poliomyelitis was made by Dr. Charles Armstrong when in 1939 he successfully adapted the Lansing strain of human poliomyelitis virus to rodents. This was the first time such an adaptation had ever been accomplished, and much of the laboratory research done in the past 10 years in poliomyelitis has been possible because of it. Large numbers of mice could be used with the Lansing strain in types of experiments which previously required monkeys.

Doctor Armstrong, with Dr. Walter T. Harrison, worked out the basic principles involved in the experimental prevention of poliomyelitis by coagulating sprays given intranasally, and in subsequent field studies demonstrated that this procedure was not a practical one for use in human populations. Doctor Armstrong has been a member of several advisory committees of the National Foundation for Infantile Paralysis since it was established.

Typhus

For centuries, typhus fever was one of man's chief scourges. It is among the historic pestilences which swept over countries as an ac-

companiment of famine and in the wake of war. In the Western Hemisphere, the great epidemic of 1576-1577 in Mexico is reputed to have killed 2,000,000 Indians. During and after World War I, the disease claimed millions of victims, especially in Russia.

Typhus resembles typhoid fever, and was thought to be the same disease until Gerhard differentiated them in an outbreak of typhus in Philadelphia in 1836. It is more abrupt in onset and termination and is characterized by a profuse skin eruption. The disease had always been associated with crowding, poverty, and filth, but it was not until 1909 that a French scientist named Nicolle discovered that it was transmitted by the body louse.

Epidemic typhus never has gained a permanent foothold in the United States, in spite of outbreaks in Philadelphia in 1883 and in New York in 1891-92. Only sporadic cases occurred among immigrants at seaports and along the Mexican border. Medical men were not especially concerned with it. Then in 1910, Dr. Nathan Brill drew attention to a disease he had first noticed in New York City in 1898. It had a clinical course very much like typhus but much milder, and Doctor Brill at first thought he was dealing with a new disease entity. In 1915 he recognized that Brill's disease was a form of typhus fever.

In the meantime, Dr. John F. Anderson and Dr. Joseph Goldberger, studying the Mexican variety of typhus, "tabardillo," confirmed Nicolle's idea that it was spread by the body louse. Two scientists of the Hygienic Laboratory found that the inoculation of a monkey with blood from a recovered case of Brill's disease, made the monkey immune to Mexican typhus. Clearly, the disease in New York was typhus.

In 1917 Dr. Mather H. Neill of the Service discovered that Mexican typhus produced a scrotal reaction in guinea pigs. This was called the Neill phenomenon, and subsequently the Neill-Mooser phenomenon because later studies by Dr. Herman Mooser working in Mexico City showed rickettsiae in smears from the tunica of the testes. Doctor Neill made his observations on guinea pigs, infected intraperitoneally with several strains of Mexican typhus fever blood secured from patients at El Paso, Texas, and Neuvo Laredo, Mexico.

From that period until 1922 work on typhus was limited largely to studies of individual cases and the development of control measures

for small outbreaks. In 1921 Dr. Charles Armstrong of the Service helped control a typhus outbreak in New Mexico among Navajo Indians, which had been smouldering since 1920. Methods were also developed for large scale inspection and delousing of immigrants. Typhus research entered a more fruitful phase in 1922 when Dr. Kenneth F. Maxcy of the Public Health Service, then assigned to the Alabama State Health Department as acting epidemiologist, encountered mild typhus and became interested in the disease. Out of his preoccupation was to come a completely new viewpoint on the natural history of typhus which set the stage for the conquest of the disease on American soil.

Very early in his observations, Doctor Maxcy came up with a radical idea. The concept "no lice, no typhus" was then universal among the experts. But the typhus patients Doctor Maxcy had dealt with had not had lice. Most of them, however, had been associated with occupations involving food handling.

Doctor Maxcy was transferred to the Hygienic Laboratory in 1925, and continued his work on typhus for the next four years, utilizing extensive laboratory facilities to back up his work in the field. In 1926 he published a complete clinical description of the disease, and during the winter of the same year recorded the results of field investigations covering four years. This last publication, "An Epidemiological Study of Endemic Typhus* (Brill's Disease) in the Southeastern United States with Special Reference to its Mode of Transmission," became a classic in the study of typhus.

Through his analysis of the distribution in the human population of the particular manifestation of typhus fever with which he was occupied, Doctor Maxcy demonstrated clearly that the cases investigated in Alabama and Savannah, Georgia, were not transmitted by the louse. He deduced that there must be a domestic rat or mouse reservoir of the typhus organism which was then transmitted to man by a flea, mite, or possibly tick. He carried out numerous experiments which were invaluable to later workers on typhus. He left standard strains of typhus, well established in animals, plus the "know-how" of handling them in the

*The name "endemic typhus" has been generally replaced in the literature by the more appropriate name "murine typhus." There remain unexplained differences between the strains of murine typhus and the strains of Brill's disease isolated in New York.

laboratory. Epidemiological studies by Doctor Maxcy through a program of rat trapping in Savannah, Baltimore, and New Orleans in cooperation with the Quarantine Division of the Service produced evidence which pointed toward a rodent reservoir.

Doctor Maxcy himself never attempted to isolate a strain directly from a wild rat or its ectoparasites. It remained for his successors at the Hygienic Laboratory to show which ectoparasite was the transmitting agent.

When Doctor Maxcy left the Laboratory in 1929 to become Professor of Preventive Medicine at the University of Virginia, Dr. R. Eugene Dyer was put in charge of the typhus work. Associated with him were Dr. Lucius F. Badger, Dr. Adolph S. Rumreich, and later Dr. William G. Workman and Dr. Elmer T. Ceder.

These scientists set out on a relentless insect hunt. Fleas were collected from rats trapped by the Baltimore Quarantine Service. Colonies of mites were set up in the Hygienic Laboratory. When the tick season opened in March of 1930, quantities of ticks were collected. Ticks never proved to be typhus carriers, but the work on ticks contributed an important piece of medical knowledge. Numerous so-called typhus cases had been reported to the laboratory from nearby Virginia and Maryland, and half the cases had a history of tick bite. Doctor Dyer was able to isolate two or three strains of this supposed typhus and start them in guinea pigs.

Looking at a patient in a Washington, D. C., hospital with Doctor Dyer one day, Dr. Roscoe R. Spencer, the spotted fever expert, said: "If we were in Montana, I would say that was spotted fever." Doctor Dyer immediately sent to Hamilton for a strain of spotted fever; and turned over to Doctor Badger the Hamilton and Virginia strains for comparison.

Simultaneously, Doctor Rumreich, in the course of his field investigations, had become convinced that the tick was not a vector for typhus but that two similar diseases were being confused. At the same time Doctor Badger was comparing the two strains, Doctor Rumreich presented his findings that Rocky Mountain spotted fever existed in these eastern States and was being called typhus. This delineation was a major aid in the diagnosis and treatment of both diseases. Doctor Dyer had started a flea colony in September of 1929 but did not succeed in passing

typhus from guinea pig to guinea pig by the flea. It was not until two years later that Doctor Dyer, with Doctors Rumreich and Badger, recovered three strains of typhus from fleas collected from rats trapped near food handling establishments in Baltimore where typhus cases had been reported. The final link in the chain of evidence was the finding of the infection in a wild rat taken from a focus of human infection by Mooser, Castaneda and Zinsser in Mexico.

It was subsequently proved that typhus infection may be transmitted from rat to rat by the flea; that the infection may take place through feces of the flea rubbed into a wound. Two decades of careful work had proved that murine typhus is a disease (closely related to epidemic typhus) which is maintained among the rodents by fleas and communicated by them to human beings who frequent rat-infested neighborhoods.

These findings set the stage for another chapter in the conquest of American typhus. Experiments reported by Dr. Herald R. Cox of the Rocky Mountain Laboratory showed clearly that a high degree of active immunity was induced in guinea pigs against epidemic typhus by the use of killed vaccines prepared from infected tissues of developing chick embryos.

Drs. Norman H. Topping and Ida A. Bengtson at the National Institutes of Health, using the Cox vaccine as a basis, modified the technique and obtained an even more effective product. They and their associates in the Laboratory of Infectious Diseases also developed a practical method of testing the vaccine for potency and demonstrated the necessity of administering a booster dose approximately every six months. These new findings concerning vaccine production and immunization procedures resulted in the successful protection of thousands of our servicemen in World War II from the devastating epidemics of typhus among both military and liberated civilian populations that occurred during and after World War I.

EARLY FIELD INVESTIGATIONS OF TYPHUS FEVER DURING WORLD WAR II

In nearly all wars of any magnitude epidemic typhus fever not only has seriously influenced military operations but has been the chief hand-

maiden of the Fourth Horseman—Pestilence—creating havoc among disorganized populations. It has been said, and with some element of truth, that it has determined the outcome of military campaigns almost as often as broad military strategy. In World War I it immobilized large armies in the Balkans and in its aftermath killed hundreds of thousands of civilians in Eastern Europe and Russia.

Even before America's entrance into World War II Dr. R. Eugene Dyer had been in consultation with the Chiefs of Preventive Medicine of both the Army and Navy. They had determined that the typhus vaccine, developed by Dr. Herald R. Cox in the Rocky Mountain Laboratory, should be used by our forces in potential typhus areas, and efforts to improve this vaccine were under way in laboratories of the Service as well as elsewhere. It had not been tested in humans exposed under natural conditions, but the evidence was at least good that it prevented death in laboratory personnel.

The Army, Navy, and Public Health Service jointly recommended the creation of a Typhus Commission to study the unanswered problems the disease might pose. This was accomplished on December 24, 1942, by Executive Order 9285 which set up the United States of America Typhus Commission. From the Public Health Service Dr. R. Eugene Dyer, Dr. Norman H. Topping, and Dr. William L. Jellison were made members, and Dr. Alexander G. Gilliam was appointed an epidemiologist. The other 14 original members of the Commission were drawn from the Army, Navy, and Rockefeller Foundation.

The Commission immediately set up a field station in Cairo, Egypt, and developed a laboratory and experimental clinical ward with the cooperation of the Egyptian Ministry of Health. Doctor Gilliam's assignment was to test the efficacy of typhus vaccine under natural conditions of exposure. A rigidly controlled field study undertaken in three villages near Cairo failed in its mission because typhus was already well under way in Egypt on arrival of the Commission and because it proved to be impossible to follow clinically the vaccinated villagers and those used as controls.

An alternative study among personnel of the fever hospital was then undertaken and, though this was not the rigidly controlled field in-

vestigation desired, it remains today the only quantitative evaluation of typhus vaccine under conditions of natural exposure.

Doctor Gilliam also made an investigation of the typhus problem in Tripoli. This city had just fallen to the British Eighth Army, and typhus was thought to be a major problem among native residents of the city. Fortunately, little typhus was encountered since control might have been difficult among a hostile population in a city under fairly constant aerial attack.

Lymphocytic Choriomeningitis

When Dr. Charles Armstrong returned to the National Institute of Health from assisting Dr. James P. Leake with the investigations of the St. Louis outbreak of encephalitis in 1933, he brought with him samples of brain tissue from fatal cases. From one of these he isolated a new virus and in 1934 gave the first description of the agent which he named lymphocytic choriomeningitis virus, a name derived from the pathological lesions produced by the virus in mice and monkeys. The French, however, have designated the disease "La Miladie d'Armstrong."

Assisted by Dr. Paul Dickens of the U. S. Naval Hospital in Washington the disease caused by this virus in man was recognized in 1935 and the following year Doctors T. F. Scott and Thomas M. Rivers isolated the same virus from the spinal fluid of a laboratory worker in New York.

Working together, Doctors Jerald G. Wooley, Robert H. Onstott, and Charles Armstrong demonstrated that 11 percent of 2,000 sera collected from persons living in various parts of the United States contained antibodies against the disease, although most of them denied ever having had any disease suggesting the meningeal type of symptoms associated with illness recognized as due to infection with this new virus. This led to the suspicion that the disease did not always manifest itself by central nervous system involvement. This suspicion was confirmed when Dr. Victor H. Haas and Mr. Manuel Sisson contracted the disease in the laboratory. The latter individual developed a severe illness with meningitis while Doctor Haas suffered a much milder "grippe-like" type of infection which the clinicians diagnosed as uncomplicated influenza; a diagnosis which would have maintained had not Doctor Armstrong

isolated choriomeningitis virus from the patient's blood and had he not demonstrated the development of immunity in the patient. This was the first instance wherein a naturally acquired infection of choriomeningitis with "grippe-like" symptoms was established.

The serum survey also demonstrated that the virus of lymphocytic choriomeningitis is widely distributed throughout the United States. Various workers, moreover, have isolated the virus in many lands; England, France, Japan, North Africa, Ireland, Holland, and others—there are reasons to feel that it is world-wide in distribution.

Whenever observed the disease appeared to lack any tendency to spread from person to person, which led Doctor Armstrong to search for an animal reservoir for the disease. Such a reservoir was found in common house mice. Among mice trapped in homes where the virus was proven to be present, 53 percent of 123 mice were found to be harboring the virus and from 307 mice trapped at random in the District of Columbia, one out of every five was found to be infected with choriomeningitis virus. This knowledge supplied the obvious means for preventing the disease by simply destroying or excluding mice from buildings frequented by man.

In addition to the workers above mentioned, Dr. Ralph D. Lillie made notable contributions to the knowledge of the pathology induced by the disease especially as it relates to the experimental disease in animals.

Fluorine and Tooth Decay

Few research groups have the satisfaction of making immediately practical contributions to the well-being of millions of human beings, but such is the case for the National Institute of Dental Research. In less than a quarter of a century, dental investigators have played the major role in work leading to a marked reduction in the amount of tooth decay.

The story of this rewarding research problem is essentially the story of how the National Institute of Dental Research came to exist in the Public Health Service. It begins in March 1926, when the State Health Officer of Arkansas asked the Public Health Service to survey the town of Bauxite, Arkansas, where far too many citizens were plagued with a seriously disfiguring tooth ailment called mottled enamel.

(From USPHS Records)

Dr. H. Trendley Dean

The gravity of the mottled enamel problem, common then in many parts of the United States, is illustrated by this description in the dental literature of this period.

> Try to put yourself in the place of a young person with teeth marred by this defect. Your teeth carry white chalky patches or perhaps the entire surfaces have lost their natural translucency. It is quite probable that the enamel has become pitted and corroded . . . they might have been almost black . . . Your dentist tells you that you will have spent almost a thousand dollars to save your teeth when you reach the age of 30, but he may not be able to preserve them beyond that age. You may try artificial teeth in your teens to avoid further handicaps in your business and social life.

The survey of Bauxite was completed in 1928 by Dr. Frederick S. McKay, a consulting specialist in mottled enamel, and Dr. Grover A. Kempf of the Public Health Service.

The significant work on mottled enamel, out of which was to come the amazing findings on tooth decay, did not begin until 1931 when a Dental Hygiene Unit was established at the newly-named National Institute of Health (previously the Hygienic Laboratory). The unit consisted of a single dental officer, Dr. H. Trendley Dean. Several investigators had just reported that the cause of mottled enamel was the presence of fluorine in drinking water. Doctor Dean set to work immediately to determine whether or not this was true; and if so, how much fluorine could be present in water before mottled enamel began.

He applied the principles of epidemiology—at this time not common in the field of dental research—in a series of studies in different communities. Recognizing the urgent need for an analytical chemist, he enlisted the aid of Dr. Elias Elvove, also stationed at the National Institute of Health, who developed a new, more accurate method of determining the amount of fluorine in water. Together, Dean and Elvove proved conclusively that too much fluorine causes mottled enamel and established the safe limits of fluorides for drinking water. In addition, Doctor Elvove developed a method to remove excess fluorides from water supplies.

FIELD STUDIES

As the studies on mottled enamel led the investigators into different communities, a new picture began to take form. Tooth decay in children

was different in the fluoride areas when compared to the fluoride-free communities. Doctor Dean followed up this observation in a survey of 3,300 school children in 51 communities in South Dakota in 1938. Analysis of this study in relation to an earlier study by the Public Health Service showed definitely that children who lived in areas where mottled enamel was endemic (and there was a high fluoride content in the water) had far less tooth decay than children living where mottled enamel was non-existent.

This was the first of a series of full-scale epidemiological studies carried out all over the United States since 1938 that proved that the proper amount of ingested fluoride can control tooth decay.

At about this time, dental research at the National Institute of Health began to expand. The research program was enlarged to include studies on the physiology and toxicology of fluoride compounds. Much of this latter work was carried out under the direction of Dr. Frank J. McClure, who joined the unit in 1936. His studies in this field are classical, and are of invaluable practical aid as the work moves into its current phase of caries control through fluoridation of public water supplies. A second dental officer, Dr. Francis A. Arnold, Jr., joined the group in 1937.

In 1942 Doctors Dean, Arnold, and Elvove reported a detailed study of 21 cities in four States which established that drinking natural fluoride-containing waters during the early years of life gave an increased resistance to dental caries. This and earlier work opened up a broad field of preventive medicine, pointing the way to two mass control methods for tooth decay: Artificial fluoridation of public water supplies and painting teeth with sodium fluoride solutions.

While these country-wide studies were in progress from 1938 to 1948, laboratory research at the National Institute of Health was expanding. Animal experimentation was begun to learn how fluoride ingestion might affect the human body. Some of those investigations led the workers away from fluoride into basic research on the cause and prevention of disease of the teeth and surrounding tissues.

In June of 1948, in recognition of the standard of research conducted by the dental unit, Congress enacted legislation which established the National Institute of Dental Research. With Doctor Dean as Director,

the one-man dental hygiene unit of 1931 had become one of the world's outstanding dental research institutions.

Since 1945, a still more extensive 10 to 15-year control study has been undertaken by the Public Health Service in cooperation with the Michigan State Health Department and the University of Michigan. The proper amount of fluoride to control decay has been added to the Grand Rapids, Michigan, water supply. Public water supplies in the control city, Muskegon, are fluoride free.

Each year, about 6,000 school children in the two cities are surveyed for signs of tooth decay. Preliminary reports indicate sharp reduction in the amount of decay among the Grand Rapids children, compared to larger amounts among Muskegon youngsters. Twelve years of epidemiological study by Public Health Service investigators have proved that the simple process of adding sodium fluoride to drinking water should reduce tooth decay about 65 percent. In the remaining 35 percent it is relatively a minor problem.

These findings, largely due to the work of Public Health Service scientists, have brought the United States today to the threshold of general fluoridation of all local public water supplies. This means, in terms of human beings, that future generations of Americans have every hope of growing up without, or with very little, tooth decay.

Psittacosis

Until 1929 Americans had no cause to think twice about owning parrots. Psittacosis, now commonly called "parrot fever," was a rare disease, known only in the medical journals. Perhaps a handful of physicians in the country had been in direct contact with it. No one at the Hygienic Laboratory, where rare diseases were not uncommon study matter, had ever seen a case.

In November of 1929 a spectacular outbreak of a highly virulent disease intruded on the public consciousness. A case was reported from Annapolis, Maryland, and shortly thereafter, additional cases from Baltimore, Philadelphia, and Washington. The disease was like both pneumonia and typhoid fever. The patient ran a high fever, suffered lung congestion, slow pulse, and late delirium. The fatality rate was

frighteningly high. (Of the 169 cases reported from November 1929, to May 1930, 33 were fatal).

A similar outbreak in Argentina earlier in the year helped physicians to make a quick diagnosis. The disease was psittacosis, an ailment first described by a Swiss scientist named Ritter in 1879. The tragic case of a Swiss family who kept parrots and finches had brought it to Ritter's attention. Three weeks after one of the birds died, five members of the family and two visitors became seriously ill. Three of them died.

Occasional outbreaks of psittacosis in different parts of the world were recorded in the medical journals after Ritter's identification. During an outbreak in Paris in 1892, E. Nocard isolated an organism from the wings of parrots which was later identified as a bacterium of the *Salmonella* group. Nocard's Bacillus was generally accepted by scientists as the cause of psittacosis.

When the first case of psittacosis occurred in Annapolis, the local medical men at once turned, through the State health department, to the Hygienic Laboratory for expert scientific advice. When the outbreak spread to other cities, Dr. Charles Armstrong was put at the head of a full-scale study. The outcome of this simple assignment has had few parallels in scientific investigation. But from the tragic events which followed, science gained valuable new knowledge.

Early in December 1929 Doctor Armstrong and his assistant, Harry Anderson, visited a number of psittacosis patients and collected several of their pet parrots. They took the birds, some sick and some well, back to their working headquarters which were set up in two rooms in the Laboratory building at 25th and E Sts., N.W., Washington, D. C.

Because psittacosis was believed to be caused by the highly infectious *Salmonella* organism, the scientists took elaborate precautions to prevent any spread to other workers. The experimental animals were kept behind moist curtains and troughs of disinfectants placed in the doorways. Under these conditions, Doctor Armstrong and Anderson began at once to infect laboratory animals with parrot material to try to recover Nocard's Bacillus. All attempts to isolate the organism were futile. The work had gone on for only nine days when Anderson became ill at his home on a Saturday night. He came to work as usual on Monday, look-

ing seriously ill and having a high fever. He was immediately sent to the U. S. Naval Hospital in Washington with a provisional diagnosis of psittacosis.

Eleven days later Doctor Armstrong began to notice the now familiar symptoms of psittacosis in himself. The day after Doctor Armstrong entered the Naval Hospital, Anderson died. In rapid order, after Armstrong's becoming ill, a night watchman and eight other workers, none of whom had been directly exposed to the sick parrots, came down with psittacosis.

Scientists do not go into a panic easily, but the situation had perilous possibilities. It was a time for quick and sober-minded action. The Director of the Hygienic Laboratory, Dr. George W. McCoy, temporarily stopped the work on psittacosis and closed down the entire Laboratory for the first time in its history. All psittacosis infected animals were destroyed and the building was fumigated. At the time Anderson became ill Doctor McCoy had refused to permit anyone but himself to take over Anderson's work (against strong protests from his subordinates). When Armstrong became ill, Doctor McCoy was carrying on the work alone, but due probably to the odd quirks of individual immunity he never contracted the disease.

Both the early studies and the later resumption of work on psittacosis resulted in three valuable pieces of information: (1) The agent which causes psittacosis is diffused through the air with incredible ease; (2) some of the victims had come no closer to the psittacosis experiment than to pass through adjacent rooms; and (3) the infection was considered to be spread as a "powder down" thrown off by the parrots, in a manner similar to the spread of pollen in the air.

These conclusions served as a stern warning to other laboratories working on psittacosis.

A filterable virus, not Nocard's Bacillus, was found to be the cause of the disease. This large virus was almost simultaneously demonstrated by staining methods in infected tissues and exudates by Dr. Ralph D. Lillie of the Hygienic Laboratory, and by A. C. Coles of the Lister Institute in London, and W. Levinthal in Berlin. Doctor Armstrong's field work also supplied the data for Executive Order No. 5264 issued by President

Hoover on January 24, 1930, which prohibited the importation of psittacine birds into the United States unless subjected to regulations prescribed by the Secretary of the Treasury. The subsequent bird quarantine and interstate restrictions were administered by the Public Health Service.

In 1930 there was no known effective treatment for psittacosis. Convalescent serum, taken from the blood of recovered psittacosis patients was tried out. The Hygienic Laboratory had a major role in securing and distributing this serum. Dr. Roscoe R. Spencer made numerous trips to all parts of the country to draw blood from individuals glad to give others hope of quicker recovery.

One of the more spectacular cases involved the wife of the late Senator William E. Borah. When she developed psittacosis, her doctors appealed to the Hygienic Laboratory for convalescent serum. Doctor Armstrong was bled and the serum was prepared and rushed to Idaho by plane. Mrs. Borah was near death when the serum arrived. After it was given to her, she improved rapidly, and eventually recovered. The Borahs were convinced the serum had saved her life, but Dr. George W. McCoy and the Laboratory staff maintained a strict scientific detachment because they never proved to their own satisfaction that the serum was truly effective.

Jamaica Ginger Paralysis

During 1930 a peculiar form of paralysis afflicted a number of persons in some of the southern, midwestern, and southwestern States. Definite figures on the extent of this condition are not available, but it is certain that the numbers ran into the thousands. This condition was noted in areas in Alabama, Mississippi, Georgia, Kentucky, Oklahoma, Tennessee, South Carolina, North Carolina, Louisiana, Ohio, and California.

Epidemiological studies at the Cincinnati General Hospital by Dr. Thomas J. LeBlanc clearly brought out the close relationship of this condition to the consumption of fluid extract of ginger. Almost exactly the same data were obtained in an epidemiological study by Dr. Howard C. Stewart of the Tennessee State Health Department. This study by Doctor Stewart was of 119 cases that occurred for the most part in

eastern Tennessee. The studies made in Cincinnati and those in Tennessee agreed in that the great majority of the patients were males; that the disease affected all ages between 20 and 80 years, usually 40 years of age; that no cases occurred among children and very infrequently among young adults; and that in practically all cases the history of drinking ginger could be obtained. Another significant fact disclosed by these investigations was that an interval, usually from 10 days to three weeks, elapsed between the drinking of the suspected ginger and the onset of the paralysis. Histories were obtained indicating that one drink of as little as one ounce of the ginger extract produced essentially the same result, except for some difference in degree that followed the drinking of 10, 15, or more two-ounce bottles over a period of some days.

Examination of some of these cases was done by Dr. Maurice I. Smith of the National Institute of Health of the Public Health Service.

Studies were also conducted in 1930 by Dr. David T. Bowden and associates of the University of Oklahoma School of Medicine and Dr. W. H. Miles and associates of the Oklahoma City Health Department. There were about 60 cases in Oklahoma City and slightly more than 500 cases in the State of Oklahoma. In February 1931, there was another outbreak in California and Dr. George Parrish, Health Officer of Los Angeles, made a report on these cases.

Clinically the patients presented bilateral wrist drop and foot drop of varying degrees of severity. In the milder cases the patients could get about with the aid of canes or crutches; in the severer cases the patients were bedridden and in many instances were unable to feed themselves. In the more advanced cases the paralysis in the upper extremities did not extend above the elbows, and the thigh muscles were seen to be involved in the lower extremities. There were no visual disturbances or other evidence of involvement of the cranial nerves.

For a time this condition was thought to be some new or obscure disease perhaps derived from livestock or fowls. The careful epidemiological study made in Tennessee seemed to point toward the ingestion of Jamaica ginger as a factor common to all cases in that area. (It should be recalled that this incident occurred during the days of national prohibition when it was illegal to sell alcoholic beverages.) This led to the

thought that perhaps the ginger contained some denaturant or adulterant used in the manufacture of the substance, since it was known with certainty that adulterants of certain kinds had been used for several years in the manufacture of the ginger beverage.

When the epidemiological studies began to point toward the possibility of some adulterant or denaturant in Jamaica ginger, the problem of securing samples of the actual Jamaica ginger drunk by some of the victims was a difficult one. The Jamaica ginger was sold in two-ounce bottles. Usually very little of the fluid was left in any of the bottles that were discarded. Most of them were completely emptied. Many patients were visited and questioned as to whether they could recall if they had consumed all of the bottle, and if not, where they had disposed of the unconsumed fluid. In most cases, they could not recall. Finally, after much careful and painstaking search, 13 samples of the Jamaica ginger were secured. Many of these bottles were thrown into outdoor toilets, and in a number of instances the bottles that contained some of the remaining fluid had to be secured from these outdoor toilets by various means.

After securing the 13 samples of Jamaica ginger Dr. Maurice I. Smith and Dr. Elias Elvove, a chemist, of the Public Health Service at the National Institute of Health, undertook laboratory and animal experimental work which indicated the presence of a compound identified as tri-ortho cresyl phosphate. Pharmacological evidence showed that the adulterated fluid extract of ginger used for beverage purposes that resulted in this outbreak of ginger paralysis contained about two percent of tri-ortho cresyl phosphate. This compound apparently had been used by the manufacturer in certain lots of Jamaica ginger sold in the areas affected. Jamaica ginger was a common substitute for alcoholic beverages that was widely used throughout the South and Southwest during the prohibition era.

The ingenious epidemiological methods and exacting pharmacological work necessary to show that these cases were due to the ingestion of tri-ortho cresyl phosphate in Jamaica ginger were brilliant accomplishments of Dr. Maurice I. Smith and his co-worker, Dr. Elias Elvove. The tri-ortho cresyl phosphate had been added to the Jamaica ginger for the purpose of giving volume and body to it.

(From USPHS Records)

Dr. Maurice I. Smith

(From USPHS Records)

Dr. Mason V. Hargett

Yellow Fever 1937-1946

The danger of yellow fever's being reintroduced into the United States was cause for concern in 1937. A short time before, Dr. Fred L. Soper and colleagues of the Rockefeller Foundation, working in South America, had demonstrated the existence of a jungle reservoir of this infection in various parts of that continent. The increasing volume of air traffic from South America to the United States afforded a rapid means of introducing infection, by man or mosquito. Travel time was less than the incubation period in man, and it was known that the common transmitter, *Aedes aegypti* mosquito, could survive such a trip. Miami, Florida, was the foremost danger spot, as most air traffic from the southern continent entered at that port, and the Miami area was infested with aegypti mosquitoes.

In view of this threat, Dr. Mason V. Hargett, who had just completed special studies in tropical medicine, was assigned (at the suggestion of Dr. Charles L. Williams, Sr., then Chief of the Foreign Quarantine Division) to Miami to undertake anti-yellow fever activities. The following measures were carried out in 1937 and 1938:

(a) Persons leaving the United States for visits to infected regions were vaccinated against the disease upon request. Special efforts were made to vaccinate air-line personnel.

(b) Airplanes from yellow fever areas were sprayed with insecticide (pyrethrum type) shortly prior to arrival, or after arrival and prior to disembarkation. From time to time planes were fumigated with hydrogen cyanide gas to kill insects that might be harbored.*

(c) Immediately following disembarkation of passengers and crew, and prior to unloading of mail, express and baggage, planes from yellow fever regions were searched (six minutes allowed) for insects to determine if mosquitoes capable of transmitting yellow fever might be on board. The crew and passengers from such planes were examined immediately following disembarkation. Those from danger areas who were not known to be immune were placed under surveillance if they

*Cyanide fumigation for mosquitoes was tried but soon abandoned when it was established that pyrethrum spray would kill all *Aedes aegypti* in a closed space.

were proceeding to an *Aedes aegypti* infested district, unless at the time of entry they had been away from the danger zone for six or more days. A special questionnaire document, "Certificate of Origin of Passenger," was developed by Drs. Charles L. Williams, Sr., Calvin B. Spencer and John D. Long of the Service in cooperation with Pan American Airways, and utilized to expedite processing of incoming persons through quarantine. Surveillance consisted in determining the final date of the possible incubation period and requesting the individual concerned to report to the local health officer at once if evidence of infection developed prior to or on this date. Local health officers of those areas to which such persons went were notified directly by the Service Quarantine Officer at Miami, who requested them to keep such individuals under surveillance until the incubation period had passed, and to notify the Surgeon General of the Public Health Service immediately if infection developed.

(d) Mail, express, freight, plane stores, and the like, were not subject to treatment or inspection except as noted under (b) and (c) above.

(e) The Public Health Service strongly supported and partially subsidized the Dade-Broward (Counties) Anti-Mosquito Authority in its effort to eliminate *Aedes aegypti* from the greater Miami area. By keeping the incidence of this mosquito low, it was hoped that if infection were introduced it would not become established.

(f) Research studies were undertaken relative to mosquito species found aboard incoming planes, the mosquito species of southern Florida, and development of better disinsectization procedures. The Pan American Sanitary Bureau, Pan American Air Lines, the Dade-Broward Anti-Mosquito Authority, the City of Miami, the Public Health Service, and others took part in making the above-mentioned measures effective. Yellow fever did not appear in Miami during this 1937-38 period.

As the danger of importing this virus into the United States became more apparent, it was determined by Surgeon General Thomas Parran that a medical officer of the Service should receive special training in yellow fever. Since the disease had been absent from the country since 1905, few Service officers on active duty were familiar with it. Doctor

Hargett was relieved in 1938 from Miami and directed to proceed to Brazil for duty with the International Health Division, Rockefeller Foundation, for the purpose of studying yellow fever. He returned to the United States in December 1939, after completing these studies.

In preparing for defense against a possible invasion of yellow fever, it was deemed advisable to have a cadre of immune American health personnel immediately available for duty in epidemics which might develop. After arrangements were made by the Public Health Service with the State of Texas, Doctor Hargett was dispatched to that State to vaccinate physicians, nurses, and attendants, who were available and willing to receive this vaccine. State and local health staff members, together with a number of Public Health Service personnel, were inoculated during January 1940.

In 1940 it was decided to establish a yellow fever laboratory at the Hamilton, Montana, unit of the National Institute of Health. The purpose of this unit was to prepare yellow fever vaccine and to undertake pertinent research in the yellow fever field. The Hamilton location was chosen because it provided basic laboratory facilities and because there was no danger of the virus's being disseminated, suitable vectors not being found in Montana. Doctor Hargett reported to Hamilton in October 1940, and was joined later that year by Mr. Harry Burruss, a bacteriologist, who had shortly before left the Brazilian yellow fever laboratory of the Rockefeller Foundation after 12 years of service with the Foundation in Africa and South America.

Vaccine production was initiated at Hamilton in February 1941, with both serum-containing and *serum-free* types being prepared. The universal practice in both North and South America at this time was to add non-immune human serum to the virus culture in order to stabilize the very labile vaccine virus. Yellow fever vaccines are living cultures of attenuated yellow fever virus; immunization results from the very mild infection resulting from inoculation with this living virus in man. This *serum-free* vaccine was prepared because a number of jaundice outbreaks following administration of the serum-containing product had been reported in South America, and it was strongly suspected that the jaundice-inducing agent was associated with the serum component.

Vaccine production continued on a small scale with both serum-containing and serum-free lots being prepared at Hamilton.

By the summer of 1941, the serum-free vaccine had been thoroughly tested in the laboratory and several persons had been satisfactorily vaccinated with it. Field tests were desired and in July 1941, arrangements were made with Dr. Anthony Donovan of the Public Health Service for a trial in Peru, South America, where he was then on duty. These trials were under way in the spring of 1942 when the extensive outbreak of homologous-serum hepatitis, associated with yellow fever vaccination of military personnel with serum-type vaccine, developed.

Up to this time, relatively meager quantities of vaccine had been prepared. Shipments were made in small lots, and principally to stations of the Public Health Service and industrial firms. Serum-containing vaccine was supplied these recipients. None of these lots was found to harbor the virus of homologous-serum hepatitis.

Serum used in preparing the serum-type vaccine was obtained from blood purchased ($25.00 per 500 ml.) from University of Montana students, through arrangements with the Director of Student Health, Dr. Meredith B. Hesdorffer. These donors had been examined by, and were under the surveillance of, University physicians.

As a result of the extensive homologous-serum hepatitis which developed early in 1942 among troops which had received serum-containing yellow fever vaccine, the Hamilton Laboratory was directed in April of that year to supply yellow fever vaccine to the Army. At the time, some 90,000 doses of serum-type and a little non-serum-type vaccine were on hand. Almost all of this was forwarded to the Army. Without waiting for field test results, manufacture was switched to the serum-free vaccine and production was expanded.

Fortunately, Dr. R. Eugene Dyer, Director, National Institute of Health, had visited Hamilton in February 1942 and had taken administrative action which materially strengthened the yellow fever program. Also in May 1942, Dr. Charles Armstrong, Chief, Division of Infectious Diseases, National Institute of Health, visited the laboratory and gave considerable assistance in increasing vaccine production. It was at this time that he came down with tularemia, which almost cost his life.

Shortly before, Dr. John W. Hornibrook and Technologist Alice Chinn were assigned by the National Institute of Health to assist in increasing production. Among the many who played an important role in meeting this emergency situation were Mr. Harry Burruss, Mr. Clarence Robinson, Mr. Nicholas Kramis, Mr. Alvin Lutz, Dr. William L. Jellison, Dr. Ralph R. Parker, Mr. Frank O'Donnell, Mr. Everett Cole, Mr. Edward Grimes, Mr. Max McKee, and numerous others in Hamilton, Montana, and Bethesda, Maryland. Great credit belongs to Dr. Mason V. Hargett for his initiative, technical skill, proficiency of operation, resourcefulness, and leadership that enabled the Service to furnish to the Army at this very critical time *all* the yellow fever vaccine used after May 1942.

During the first year of vaccine production, little was prepared and shipped, as demand was light. Following Pearl Harbor and the homologous-serum jaundice episode among troops, demand tremendously increased.

The considerable quantity of vaccine supplied the armed forces afforded an excellent opportunity to check the quality of the product, as the recipients were under military discipline and observation. No cases of yellow fever were encountered, and no instances of homologous-serum hepatitis were established. No untoward reactions occurred that could be attributed to faulty vaccine. To determine the efficacy of the non-serum vaccine in stimulating immunity, serums were secured, where possible and convenient, from persons who had received this vaccine, and tested for the presence of yellow fever anti-bodies. A total of 360 serums have been obtained to date (1950)—all proved immune. Experience at the Hamilton Laboratory indicates that *yellow fever vaccine, properly prepared and properly administered, protects all recipients against the disease.*

Research studies were initiated in 1941, and continued during subsequent years. These studies were principally directed toward producing a better vaccine, better methods of preservation, and more simple manufacturing procedures. Among the more important findings were that vaccines derived from chick embryos aged 10 days and less produced only a mild reaction, while vaccines from embryos aged 14 days and over produced a much stronger reaction in the individual who re-

ceived it. It was also shown that good quality dried vaccine was still potent after several weeks' exposure to tropical temperatures, and that the dried vaccine retained potency for at least three years under cold storage. It was shown that individual lots of vaccine need not be tested in monkeys when the parent virus is known to be satisfactory, and that a potent and satisfactory vaccine could be produced from infected chick embryos without addition of serum or other agent.

Homologous Serum Jaundice

At the beginning of World War II, simultaneous with the mass production of vaccines and serums for servicemen, the National Institute of Health scientists were confronted with a serious problem.

There was an unknown dangerous factor in some of the yellow fever vaccines being produced. During the late winter and spring of 1942, 28,000 servicemen who had been injected with yellow fever vaccine prior to the introduction of the serum-free vaccine, came down with jaundice. One hundred of the men died.

In June of the same year, the District Medical Officer of the Public Health Service in San Juan, Puerto Rico, reported to Surgeon General Parran an outbreak of jaundice in St. Thomas and St. John, Virgin Islands, subsequent to large scale inoculation against yellow fever among the inhabitants. The disease differed from the ordinary "yellow jaundice" (epidemic hepatitis) in a number of ways. The incubation period was very long and the disease did not appear to spread from one person to another. The yellow fever vaccine had contained a small proportion of pooled human serum as a stabilizing agent. There was a strong possibility that some concealed factor in human blood was causing the jaundice. At the start of the wartime program dispensing millions of pints of life-saving human blood and plasma, this was a full-scale menace that had to be overcome.

Late in June of 1942, Dr. John W. Oliphant, Dr. Alexander G. Gilliam, and Dr. Carl L. Larson of the National Institute of Health left Washington for the Virgin Islands. One of the first discoveries made on arrival in St. Thomas was the fact that the lot of yellow fever vaccine which had caused jaundice among the island inhabitants was the same lot of vaccine which had produced cases among the Army personnel.

The three scientists set up a careful study in which they sought to determine the jaundice-producing factor in the serum of the yellow fever vaccine. They set out to discover the characteristics of this agent and how it acts clinically.

Their experimental work was divided into two phases; the first was conducted in the Virgin Islands where serum samples were collected from jaundice patients for later use in a human volunteer inoculation study; the second phase of experimental human inoculation was conducted in an institution in the United States. Extending over three years, groups of volunteers aged 15 to 57, divided equally as to sex, were inoculated with vaccines or sera, and observed weekly.

The institutional work resulted in some important findings. Two lots of yellow fever vaccine containing human serum had produced jaundice in the volunteers. Blood serum drawn from these jaundice-infected individuals would, when inoculated into others, again produce the jaundice. The disease, however, was spread only through inoculation, not by personal contact.

The cause of the trouble apparently was a filterable virus, but to date no one had yet identified it under the electron microscope. One indisputable fact stood out: The jaundice agent was carried in human blood serum by individuals who may have the unrecognized disease or simply be carriers. It was impossible to tell in advance, when drawing blood from an individual, whether or not he was carrying the jaundice agent. And as blood plasma lots generally were composed of the plasma from 50 individual donors, one infected donor could contaminate the entire lot, thus pyramiding the possibilities of infection. It was true that the number of infected donors were few, but with the millions of pints of blood and plasma and the numberless injections of vaccines and serum going to our troops, it was imperative to eliminate the menace.

The National Institute of Health scientists had discovered that the jaundice agent was filterable and heat-resistant. Ultraviolet irradiation might be a way to kill the infectious organism without destroying the efficacy of the plasma.

Doctor Oliphant and Dr. Alexander Hollaender, biophysicist with the Industrial Hygiene Division, themselves designed an apparatus in which serum or plasma could be irradiated for varying periods of time.

Irradiated serum, tried on volunteers, produced no jaundice. The irradiation method appeared to work.

Since April 1949 the Biologics Control Laboratory of the Public Health Service has required that all human plasma and serums prepared from human blood be irradiated, thus reducing the danger of serum-produced jaundice.

Louisiana Pneumonitis

In the beginning of December 1942 a trapper's wife living on the Little Chenier in the isolated coastal bayou country of Louisiana came down with what was apparently some form of pneumonia. Transferred to a sanatorium at Ville Platte 120 miles away, she died two weeks later.

Shortly after, one of the woman's nurses became ill and exhibited the same symptoms. On January 6, 1943, the nurse was dead. The dead woman's husband, who had been at her side through most of her illness, went back home only to come down with the same mysterious disease. He died on January 26.

With terrifying rapidity others who had been associated with the trapper's wife and her nurse came down with this unknown scourge. Six individuals, sanatorium workers and members of the family who had cared for the nurse until her death quickly became ill, and one died. This fatal case gave rise to four others, one of whom died after passing along his illness to his son who had cared for him at Ville Platte. When the son went home to Acadia Parish (Louisiana has parishes, not counties), he transmitted the disease to his wife and two nurses. The husband and the two nurses died. A nurse attending these cases also developed the disease but recovered.

An elderly man who had occupied the room next to the dying trapper's wife came down with the pneumonia-like ailment after leaving the sanatorium. After a long and severe illness he recovered. In less than three months, this mysterious deadly illness had spread in chain-reaction from one to 19 people, eight of whom died.

Concern began to sweep through Louisiana's Creole parishes. The Louisiana State Health Department sent a request for aid to the Public Health Service in Washington. The wartime epidemic possibilities of

this deadly illness were appalling. The epidemic zone was surrounded by one of the most crucial military and shipping areas in the United States. Army camps, war plants, and the Port of New Orleans lay close to the small towns where the pneumonia-like scourge had begun its frightening course.

Early in March 1943, Dr. Byron J. Olson arrived from the National Institute of Health. Working with Dr. Waldo L. Treuting, epidemiologist of the Louisiana State Department of Health, he began a study of the patients who were still living. Physicians who had attended the mysterious cases had diagnosed various types of pneumonia. A peculiar feature of the disease was observed: The patient felt amazingly well until close to the end, when a dramatic collapse would occur, followed by death. One of the stricken nurses he visited refused to stay in bed because she felt so good. By the time Doctor Olson had left her and returned to his quarters, word came that the nurse was dead.

Many of the recovered cases experienced mental symptoms and personality changes. The disease spread on contact—probably respiratory—in the last 48 hours of the person's life. Apparently only fatal cases could transmit the disease. This disease the doctors decided to call pneumonitis, although it had features markedly different from previously encountered cases of pneumonitis.

One of Doctor Olson and Doctor Treuting's first acts was to institute what they called "the most severe quarantine ever voluntarily submitted to by American people." As quickly as pneumonitis symptoms were detected in a person, that individual and everyone associated with him were shut up in his home, or shipped out of town to other isolation quarters. All attendants wore the type of masks used in dealing with pneumonic plague. If the patient died, there was no funeral; instead, quick burial. Louisiana newspapers cooperated by maintaining a voluntary news blackout.

In the early stages of the investigation the laboratory of the U. S. Marine Hospital at New Orleans was of marked assistance. The pathologist at that hospital, Dr. Chapman H. Binford, made two trips from New Orleans to the community where these cases were occurring and performed two autopsies at different times, assisted by Dr. George H. Hauser of the State Health Department Laboratory. These two autop-

sies were done several days apart, each between the hours of midnight and early morning. It was with Doctor Binford's assistance that the autopsy material was secured which provided the material for the studies that followed.

Both Doctor Binford and Dr. Lionel E. Hooper, who was at that time in charge of the Marine Hospital at New Orleans, were aware of the fact that the bringing of this pathological material to that hospital involved a certain amount of risk, including the possible spread of the infection to the personnel of the laboratory, and even of other persons in the hospital. However, because of the importance of the outbreak of disease and the necessity of properly preparing the autopsy material for further study, the facilities of the pathology laboratory of the Marine Hospital were promptly made available.

One of the most difficult parts of the work was to be 100 percent sure pneumonitis could not spread to other parts of the United States. More than 500 people had come in contact with pneumonitis cases before the quarantine had been established. Some of them were no longer in Louisiana. With part of the work parcelled out to other State health departments, the 500 possible carriers were carefully, but quietly, checked. It had to be quiet to avoid arousing a possible panic.

Doctor Olson and Doctor Treuting had no firm conviction that they would come out of this particular assignment alive. But the stringent control measures began to take hold. After the nineteenth case of pneumonitis had recovered, the outbreak was over. Serious scientific study could now begin.

Doctor Olson returned to Washington. The danger for him and his associates was far from finished. On the top floor of the Infectious Diseases Laboratory of the National Institute of Health, he and Dr. Carl L. Larson caulked the doors tight and set up experiments on the deadly pneumonitis. At the time the last four pneumonitis patients were close to death in Louisiana, Doctor Olson had taken blood, sputum, and throat washings from the patients. These had been injected—on the scene—into mice, guinea pigs, and monkeys. These animals had been put under observation in an isolated laboratory of the United States Marine Hospital in New Orleans. Post-mortem tissues were obtained from the fatal human cases. This material became the chief working tool

of Doctors Olson and Larson in their sealed-off laboratory. For two years they worked there, piling up scientific facts to fight the ever-present menace of another outbreak of Louisiana pneumonitis. On the job, they wore rubber boots, gloves, and face masks. Before leaving the laboratory they took showers and got into complete changes of clothes.

From the deadly material Doctor Olson had obtained from the pneumonitis patients, he and Doctor Larson were able to isolate a virus. It had a marked similarity to the organism causing psittacosis and, technically, belonged to the psittacosis-lymphogranuloma venereum group of viruses. But this was a brand new member of the family, even more deadly. There were other links joining the pneumonitis virus to the rare but highly virulent "parrot fever." Pathological changes in the organs found at autopsy were similar to those noted in psittacosis.

Although it was never scientifically verified, a study of the territory surrounding the trapper's home where the mysterious outbreak had started gave another clue. The trapper's home was in the Chenieres—old ocean beaches stranded in the Louisiana coastal marshes. The Chenieres are the winter home of varieties of northern birds and are along the path of one of the great "fly ways" for migratory birds moving to and from the two Americas.

Psittacosis had been brought to the United States by parrots. Was it not likely that this new virus, first cousin to psittacosis, was also bird-borne? In Doctor Olson and Doctor Larson's sealed-off laboratory, hundreds of guinea pigs and mice were inoculated with the pneumonitis material. All of them died. Careful records were kept of the bacteriological and pathological changes, and from this experimental work Doctors Olson and Larson were able to establish the necessary basic facts for dealing with pneumonitis in the laboratory. Most important, they also were able to develop a vaccine against it.

Scientists of the National Institutes of Health know it is completely within the realm of possibility that Louisiana pneumonitis will break out again, anywhere in the United States. Probably the first cases will be diagnosed as pneumonia. But this time when it is recognized, the protective vaccine from the Public Health Service can be made available promptly.

Q Fever

Unlike many diseases studied at the National Institutes of Health, Q fever has no long and colorful ancient history. It is essentially a disease of modern medicine. In earlier times, it was undoubtedly diagnosed as influenza or pneumonia, characterized as it is by a sudden onset, fever, weakness, headache, and a pneumonia-like lung involvement. Sometimes Q fever is as mild as influenza; occasionally it is fatal. Fewer than 13 years ago it was thought to be a disease peculiar to certain areas of Australia. Now, due in a large part to facts painstakingly gathered by National Institutes of Health scientists, it is known to occur in nearly every part of the world, and to be definitely associated with a domestic animal reservoir.

The story of Q fever in the United States began quite by chance in 1935 when Dr. Gordon E. Davis, bacteriologist at the Rocky Mountain Laboratory, discovered an interesting filter-passing agent in the tissues of wood ticks collected at Nine Mile Creek, Montana. Introducing the agent into guinea pigs, he found that it produced fever, greatly enlarged spleens, and occasional deaths. He further demonstrated the susceptibility of the white rat, ground squirrels, and the rhesus monkey, and the resistance of the agent to heat and drying. Recognition of a new member of the microbiological world is always cause for some degree of scientific excitement, and this one had caused death in laboratory animals.

Dr. Herald R. Cox, another bacteriologist at the Laboratory, took up the study of the new organism, and found that it was actually not a virus but a rickettsia. With Dr. E. John Bell he produced an experimental vaccine which seemed effective in laboratory animals. Doctor Cox suggested another name for the organism, *Rickettsia diaporica,* because of its filter-passing ability.

Next came an indication that the new organism was not a local phenomenon. The Laboratory Director, Dr. Ralph R. Parker, collaborating with Glen M. Kohls and Dr. Edward A. Steinhaus, found that it occurred in the tissues of a variety of ticks collected all over the United States. Furthermore, the organism persisted for long periods in the tissues of experimentally infected animals.

LABORATORY VISITOR GETS DISEASE

The actual comparison of Doctor Cox's *Rickettsia diaporica* with the organism causing Q fever, already identified by an Australian scientist as *Rickettsia burneti* and later renamed *Coxiella burneti*, was another scientific accident. It came about because Dr. R. Eugene Dyer, who later became Director of the National Institute of Health contracted Q fever on a visit to the Rocky Mountain Laboratory in May of 1938. From the unfortunate vantage point of the victim, Doctor Dyer studied and described the clinical course of his illness. He used himself as a guinea pig, giving samples of his diseased blood. One day after his recovery he decided to inject some animals with the blood. The animals were guinea pigs which had already had injections of Q fever. The second injection, which should have made the animals sick, caused no reaction. They were immune to whatever illness from which Doctor Dyer had suffered. From this more or less accidental experiment, Doctor Dyer proceeded to prove that the new organism turned up at Hamilton was the same as *Coxiella burneti* causing Q fever.

By 1940 a full-scale investigation of Q fever was under way in the Infectious Diseases Laboratory at the National Institute of Health. Much of the work could be studied first hand because from 1940 to 1950, 80 laboratory workers contracted Q fever. One technician, Asa Marcey, died of the infection in 1940. In this period important pieces of knowledge were acquired. Dr. John W. Hornibrook and Dr. Kenneth R. Nelson showed that a pneumonic infiltration similar to a typical pneumonia was an important feature of Q fever. Dr. Ida Bengtson developed a complement fixation test used extensively in experimental studies and as a diagnostic test in man. Dr. Norman H. Topping found that sera from cases which had occurred in troops in Italy and Greece during 1946 were positive for Q fever by the complement fixation test.

STUDIES IN BETHESDA, MARYLAND

Also during 1946 Drs. Robert J. Huebner and Charles G. Spicknall surveyed a Q fever outbreak among 47 workers in the National Institute of Health. While seeking the cause of such outbreaks, Doctor Huebner found that *Coxiella burneti* is resistant to some of the agents successfully used to inactivate other rickettsias such as heat, formalin,

and phenol. With Miss Sara Elizabeth Ransom, a bacteriologist, he showed that the thermal death point of the organism exceeded temperatures generally used in the holding vat method of pasteurization. The first naturally occurring outbreaks of Q fever in the United States were reported among packing house and livestock workers in Amarillo, Texas, and later in Chicago. Doctor Topping and Dr. Charles Shepard were sent to the scene. From the data collected, they concluded that cattle, calves, or sheep killed in the abattoirs were responsible for the outbreak, and that excretions from cattle were infectious.

STUDIES IN SOUTHERN CALIFORNIA

Most of the earlier studies on Q fever were made on patients who had recovered by the time the investigators arrived on the scene. An outbreak of the disease in southern California in 1947 provided the first continuous opportunity to study Q fever in an endemic area.

Doctor Huebner, with Doctor Shepard and with the help of local and State health departments, set up a field laboratory in Los Angeles. During the next two and one-half years, Doctors Huebner, William L. Jellison, Joseph A. Bell, Lauri Luoto, and John Winn studied more than 300 human cases and carried out major epidemiologic surveys of more than 10,000 persons in the Los Angeles area.

The study proved that Q fever was not an uncommon, foreign ailment but a public health problem of serious proportions in southern California. The disease had caused thousands of cases of illness and occasional deaths in recent years. The cause was traced to infected local dairy cattle and their raw products. It was spread through contact with the infected livestock, proximity to infected dairies, and through exposure to infected raw milk.

CURRENT PROGRAM AND OBJECTIVES

With these important facts at hand, current work from 1949 to the present (1950) at the National Institutes of Health is aimed at finding workable control measures. A major objective is the development of a vaccine which will prevent animal infection. Important contributions along this line have come from Dr. Ralph R. Parker and Dr. E. John Bell of the Rocky Mountain Laboratory, and Dr. Herbert Stoenner who

showed that cows could be infected by introducing the rickettsia directly into the mammary gland or the lungs. Dr. John W. Oliphant and Dr. Edward A. Beeman reported important findings on the spread of the disease, showing that Q fever could be carried on the person, or on inanimate objects, to produce the disease in exposed individuals.

In recognition of Doctor Huebner's work on Q fever in southern California (and also on rickettsialpox) he was presented with the Award in Biological Sciences by the Washington Academy of Science on March 17, 1949, and the Bailey K. Ashford Award by the American Society of Tropical Medicine in November 1949.

Tropical Diseases

Tropical parasites causing disease seem unrelated to the everyday living of most Americans, but two things—World War II and global travel—have brought them together.

The fight against importation of certain tropical diseases to the United States and the battle against parasite-caused diseases endemic in this country are the tasks of the Tropical Diseases Laboratory of the National Institutes of Health. Several members of the group have become recognized leaders in the field of tropical medicine.

Studies in the Tropical Diseases Laboratory, directed by Dr. Willard H. Wright, range from malaria and amoebic dysentery, both common in the United States, to the potentially dangerous schistosomiasis, yaws, leishmaniasis, onchocerciasis, filariasis, and African sleeping sickness. In reality, these diseases are probably the world's most devastating infections, bringing chronic suffering and disability to millions of the world's population.

Mumps

The disease of mumps has been known for centuries. Hippocrates clearly described it in the Fifth Century B.C. as a mild epidemic sickness accompanied by swellings near the ears, and occasionally by painful enlargement of the male sex glands. Because it is a nuisance-type disease, almost never fatal, mumps understandably never received the attention of scientists trained in the more serious illnesses.

Its incidence, however, is enormous. Eighty percent of the urban population of the United States contracts mumps by the age of 17. Recent findings indicate it is probably a more serious childhood ailment than was previously supposed as there is a close relationship between mumps and encephalitis and, in some cases, deafness.

In the remaining 20 percent of the people who are still susceptible to mumps as adults, the disease is a matter of great concern. In adults, the course of mumps is longer and more severe, sometimes causing involvement of the pancreas and inflammation of the brain. In males, the swelling of the testes may destroy enough cells that sperm can no longer be produced and the individual becomes sterile.

A successful vaccine against mumps is a latecomer among preventives for infectious diseases both because the disease is mild and because it is caused by a virus, one of the most elusive of all disease-producing organisms. The difficult job of producing such a vaccine, and some of the major preliminary steps leading up to it, were performed at the National Institutes of Health by Dr. Karl Habel.

The virus causing mumps was first isolated in 1934 by scientists at Vanderbilt University in Nashville, Tennessee. The difficulty in working with the microscopically invisible organism was its disinclination to infect ordinary laboratory animals like mice and guinea pigs. It could only be reproduced in the monkey—an experimental animal far too hard to get, and too expensive, to make possible a large supply of mumps virus. Without a ready source of the mumps organism, a vaccine could not be readily produced.

The major step forward came in 1945 when Doctor Habel succeeded in growing the mumps virus in embryonated eggs. This made possible an easy, inexpensive source of virus which could be made into vaccine. A year later, Doctor Habel prepared a vaccine from the chick embryos, inactivated by ether and ultraviolet irradiation, which successfully immunized monkeys.

Before the new vaccine could be put on the commercial market, it had to be tested on human subjects. After a meticulous search, Doctor Habel tracked down the ideal test material. Every year groups of West Indian negroes are imported to the Florida Everglades to work in the fields. Every year, a large proportion of these men who had never before been

exposed to mumps came down with the disease. When Doctor Habel and his assistants arrived in Florida in 1946, the current outbreak of mumps among the new field hands already had started. Eleven hundred out of 2,800 men were given the vaccine. In the ensuing weeks, the incidence of mumps was only one-third as great in the vaccinated group as among those who had received no vaccine, and the vaccinated negroes who contracted mumps had a milder form, with less serious complications. Working with successive groups of the imported laborers, Doctor Habel found evidence that if enough individuals in a group are immunized, an epidemic can be stopped. In one camp containing 300 men, in which an epidemic had just started, 90 percent of the workers were immunized. The epidemic was over within two weeks, and only one stray case turned up 12 weeks later. This contrasted very favorably with other camps where the men received no vaccine and a heavy siege of mumps lasted for 16 weeks.

The vaccine may be of great importance in controlling epidemics of mumps among children, and it is, of course, a long-awaited safeguard for susceptible adults. While perhaps less spectacular than some other contributions of National Institutes of Health scientists, mumps vaccine may make life easier and healthier for millions of future young Americans; and may write off sterility fears from this cause for men who have not had mumps.

Rickettsialpox

In July of 1946 a mysterious disease broke out among families living in a certain New York apartment development. Children and adults came down with fever and a rash that resembled chickenpox, but no doctor could accurately diagnose the trouble as chickenpox. Later, there were outbreaks of the same unidentified disease in other parts of the city. No deaths had occurred, but the appearance of an unknown disease in a congested metropolitan area was cause for considerable alarm. A worried New York Health Department sought help from the National Institute of Health. For the next 10 weeks Dr. Robert J. Huebner personally investigated 80 of the more than 100 cases of the "Mystery Disease." Working with Doctor Huebner was Dr. William L. Jellison of the Service.

First, the scientists had to find out the kind of organism they were dealing with. Whole blood, drawn from a patient on the second day of the fever, gave them the necessary clues. From the tissues of a single mouse inoculated with the patient's blood, the scientists were able to isolate the disease cause: It was a rickettsia, according to its morphological and cultural characteristics, closely resembling *Rickettsia conori,* which causes fievre boutonneuse, a form of tick typhus found in Rumania, Portugal, and countries bordering the Mediterranean.

Doctor Huebner and Doctor Jellison reproduced the disease with no trouble in mice and guinea pigs and the yolk sacs of fertile eggs. They decided to name their never-before-recognized disease rickettsialpox. Further research showed that the infectious agent was harbored by rodents and spread to humans by mites associated with the rodents. Mr. Charles Pomerantz of New York first directed attention to the mice and their mites. These discoveries directed the way to control of the disease.

In less than six months, these investigators found the organism causing a strange new disease, showed where it existed, and how it was spread.

Cancer

The study of cancer is unlike any other scientific research problem. It is much more than the examination of a single disease entity. As Lester Grant puts it, cancer research is the "study of basic forces of life at a chemical or physical level."

Cancer investigation is full of endless complexities and contradictions. Cancer is considered to be an incurable disease, yet many are cured where the disease is detected early. The disease is related to the aging process, yet cancer cells resemble young embryonic tissue. More probably is known about cancer than any other disease, yet we are still a long way from the conquest of it. It ranks second only to heart disease as the cause of death in the United States. Two hundred thousand Americans will die of cancer in 1950, and this annual death toll is expected to double in the next half century unless an improved method of prevention and treatment is found.

Cancer research in the Public Health Service was initiated in 1922 when Dr. Joseph W. Schereschewsky at Boston, and Dr. Carl Voegtlin at the Hygienic Laboratory, began to attack the problem.

In 1937, the National Cancer Institute was established by an Act of Congress. Since that time, one of the major research programs in the United states to fight cancer has been carried on there. Dr. Carl Voegtlin was the first Chief of the National Cancer Institute and served in that capacity until his retirement in 1943, when he was succeeded by Dr. Roscoe R. Spencer. Dr. Leonard A. Scheele became Chief of the Institute in 1947. Upon his appointment as Surgeon General in 1948, he was succeeded by Dr. John R. Heller.

Investigators at the Institute have uncovered fact after fact concerning life processes as they are related to abnormal growth. The time is bound to come when all the missing pieces in this gigantic puzzle will be found. Each small piece of knowledge is an equally important part of the picture. The Institute's attack on cancer is many-sided. It is carried on through seven separate scientific disciplines, each clearly related to the disease: Biology, endocrinology, chemotherapy, biophysics, pathology, biochemistry, and cell physiology.

Pathology Laboratory

A Pathology Laboratory is indispensable in the diagnosis of disease in man and animals, and in research in diseases of man and animals it becomes of even greater importance. The pathologist in a research laboratory must be familiar not only with the effects of disease upon human tissues but must be able to recognize the changes produced by different diseases in animals used for experimental purposes. The Pathology Laboratory of the Hygienic Laboratory, and later the National Institutes of Health, has played an important part in many investigations carried on by the Public Health Service, both in field and in laboratory research.

During the earlier years of the Hygienic Laboratory the work of pathologist and bacteriologist was often combined in the same individual. At that period combined professorships of pathology and bacteriology were common in the medical schools and many pathologists made important contributions in bacteriology such as Welch, Opüls, Hektoen—and many others. The contributions of Dr. George W. McCoy of the Service to the spontaneous tumor pathology and classification in wild rats and ground squirrels are still cited.

PATHOLOGISTS AT HYGIENIC LABORATORY

It was not until 1916 that an officer especially trained in pathology as distinguished from the now diverging field of medical bacteriology was assigned to the Hygienic Laboratory. Dr. Gleason C. Lake, however, still devoted a considerable share of his time to the experimental production and therapy of disease, as distinguished from its detailed morphologic characterization. He was transferred to duty in New York City in 1927. In 1926 Dr. Ralph D. Lillie was detailed from assignment with Dr. Joseph Goldberger in nutritional disease studies to full-time duty in pathologic histology at the Hygienic Laboratory. Doctor Lillie interested himself from the start in detailed pathologic histology, both of human disease and of experimentally induced conditions in laboratory animals used in the experiments of other workers.

He and his group have contributed detailed accounts of the pathologic anatomy and histology of vaccinia in rabbits, lymphocytic choriomeningitis, and many other infectious diseases, of poisonings with the aminoagobenzenes, selenium, DDT, and related compounds, as well as atabrine and other drugs in conjunction with the pharmacologic studies of Charles Wright, Maurice I. Smith, and others. Various industrial solvents, dusts, and explosives have been studied in conjunction with the work of Paul A. Neal, Von Oettingen, and co-workers.

PATHOLOGY WORK EXPANDS

Reports from the Laboratory of Pathology may be the basis for an entirely new method of approach in studies being conducted. The following are examples of the close relationship of pathological work and scientific studies in diseases affecting man:

Almost from the beginning of Dr. Kenneth F. Maxcy's intramural work on typhus fever, Dr. Ralph D. Lillie made pathologic examinations of the brain and organs of guinea pigs and other animals infected with the disease. In European typhus strains brain examinations furnished one of the essential criteria of diagnosis, by demonstrating the characteristic lesions. Aside from this, the recognition of typhus infection in animals depended principally on the production of fever which often occurred also as a result of secondary infections.

(From USPHS Records)

Student Officers and Instructors, Hygienic Laboratory, Washington, D. C., 1915-1916.

1st ROW (left to right): Drs. Knox E. Miller, Francis A. Carmelia, James B. Laughlin, Roland E. Wynne, David J. Prather, James R. Hurley, William H. Slaughter, Albert D. Foster, Richard A. Kearny. 2nd ROW: William Lindgren (Bacteriological Technician), Drs. Calvin C. Applewhite, Arthur M. Stimson, Leslie L. Lumsden, George W. McCoy (Director), Charles Wardell Stiles, Taliaferro Clark, Lunsford D. Fricks. 3rd ROW: Drs. Herman E. Hasseltine, Newton E. Wayson, Earl B. Phelps (Chief, Division of Chemistry), Leslie C. Frank (sanitary engiener), Drs. Elias Elvove (Chemist), Mather H. Neil, Albert Stevenson (Sanitary Chemist), Dr. Joseph Goldberger.

(From USPHS Records)

Administration Building, National Institutes of Health, Bethesda, Maryland, 1950.

(From USPHS Records)

National Institutes of Health, showing construction of Clinical Center (600-bed research hospital), 1950.

Doctor Lillie continued the studies of animal pathology on typhus and spotted fever in connection with the studies of Dr. R. Eugene Dyer and his group of co-workers, from about 1929 to 1940, showing that there were distinct differences in the pathology between murine typhus, epidemic typhus, and spotted fever, by which strains could often be recognized.

During the same decade Doctor Lillie collected tissues from 20 autopsies of spotted fever cases which died in the Washington area. He took part also in most of the gross examinations at these autopsies. This study clarified the presumed differences between the pathology of Montana and Maryland cases of spotted fever by showing that the supposedly different pictures were simply those of earlier and later fatalities in the course of the disease.

From about 1927 until about 1936, Doctor Lillie actively investigated, described, and photographed the microscopic lesions of tularemia in animals used by Dr. Edward Francis in his work. Doctor Lillie also secured human autopsy and surgical material from cases of tularemia through the cooperation of pathologists all over the United States for studies of the pathological aspects in man. From this material a complete account of the lesions of tularemia in man was reconstructed organ by organ. Similarly, detailed reports of the lesions observed in each of the species being studied by Doctor Francis were completed. This account by Doctor Lillie still remains the one based on the largest number of cases so far reported.

As previously mentioned, pathologic studies of psittacosis were made coincidentally with the virus studies of Dr. Charles Armstrong in 1930. As a result the organism of psittacosis was identified in stained sections of parrot tissues. The report of this finding was made at the same time as that of Levinthal in Berlin and Coles in London. Doctor Lillie also collected tissues from nine human autopsies during the next two years and published a comprehensive account of the pathology of psittacosis in man and in laboratory animals.

The investigations of the Jamaica ginger paralysis in 1930 involved extensive work by the pathological laboratory. This was chiefly concerned with the effect of tri-ortho cresyl phosphate and the lesions produced by it in animals.

In 1936 when steps were taken by the Public Health Service to train several of its officers in clinical yellow fever, the Pathology Laboratory of the National Institutes of Health procured material for study so that a pathologist of the Service would be familiar with that disease. Accordingly, through the assistance of Dr. John R. Murdock, detailed to the Pan American Sanitary Bureau, the tissue of a number of recent cases of yellow fever was secured through the courtesy of the Brazilian Government.

This material was later turned over to the U. S. Army at the beginning of World War II and was circulated to all medical schools and army hospitals to familiarize pathologists with the lesions of yellow fever so that fatal cases might not escape recognition.

Dr. Llewellyn L. Ashburn contributed important basic work in the pathogenesis of hepatic cirrhosis, as well as describing the pathology of a number of mycotic infections under study by Dr. Chester W. Emmons and evaluating the effects of various chemotherapeutic agents on organisms of filaria and onchocerca. Dr. James H. Peers' work on the topographic pathology of equine encephalomyelitis and poliomyelitis has contributed to the possibility of definitive morphologic diagnosis of these diseases even when virus studies are unavailable.

When the invasion of Poland and the beginning of World War II put an end to importation of German dyestuffs, American malariologists were deprived of the Giemsa stain required for thick film diagnosis. A temporary substitute was made available with the help of the Pathology Laboratory by the summer of 1940, and the further preparation of this material was supervised by the Pathology Laboratory. This included the working out of an entire new method of synthesis which is still in use. This venture into staining and stain chemistry engendered further interest in these subjects and has led to an increasing participation in the now rapidly developing field of histochemistry, so that three officers now devote a large share of their time to this subject.

Dr. Kenneth M. Endicott has made basic studies of the formation of blood cells and of immune bodies. He is currently (1950) playing an important participating and coordinating function in the National Blood Substitute Program.

Laboratory of Chemistry

Dr. Joseph H. Kastle organized and was the first Chief of the Division of Chemistry of the Hygienic Laboratory. He served from 1905 to 1909. He was one of the team (with Dr. Milton J. Rosenau and Dr. Leslie L. Lumsden) who conducted the epoch-making studies on the origin and prevalence of typhoid fever in the District of Columbia which were published in Hygienic Laboratory Bulletins Nos. 35, 41, 44 and 52. Doctor Kastle implanted the spirit of scientific research which his successors have followed, each in his own way and in his own field.

From 1920 to 1927 Dr. William Mansfield Clark served as Chief of the Division. Hygienic Laboratory Bulletin No. 151 entitled "Studies on Oxidation-Reduction," reports most of Doctor Clark's pioneering work at the Hygienic Laboratory. His fundamental achievements were in the fields of oxidation and reduction equilibria, hydrogen-ion concentration, and indicators. Doctor Clark's studies have enabled investigators in almost every area of pure and applied chemistry to make notable advances, which would otherwise not have been possible. His researches have exercised great influence during the last decade in practically all fields of chemical activity.

Since 1929 the Laboratory of Chemistry of the National Institutes of Health has been under the direction of Dr. Claude S. Hudson. The work of this Laboratory has consisted principally of fundamental research on carbohydrates, with special emphasis on starch and the many sugars that occur in nature or can be synthesized in the laboratory. New or improved procedures have been developed for the isolation of rare sugars from natural sources, for their characterization and identification, and for syntheses, degradations, and transformations of many kinds.

Doctor Hudson has been the co-author of almost 200 publications since coming to the National Institutes of Health. He has received a number of prizes from national scientific organizations, among which may be mentioned the prize of $10,000 which was the Sugar Research Foundation Grand Prize (1950) and the award for Distinguished Service (1950) presented by the Federal Security Agency.

Other Investigations

REID HUNT

Dr. Reid Hunt was the first Chief of the Division of Pharmacology of the Hygienic Laboratory. He served from 1904 to 1913. He was the first to demonstrate the thyroid hormone in the blood, and to establish that the activity of thyroid preparations is proportional to the iodine content. He also showed that thyroid administration markedly increases the resistance of mice to acetonitrile; this is a sensitive and specific test for thyroid, which has been widely used in its assay.

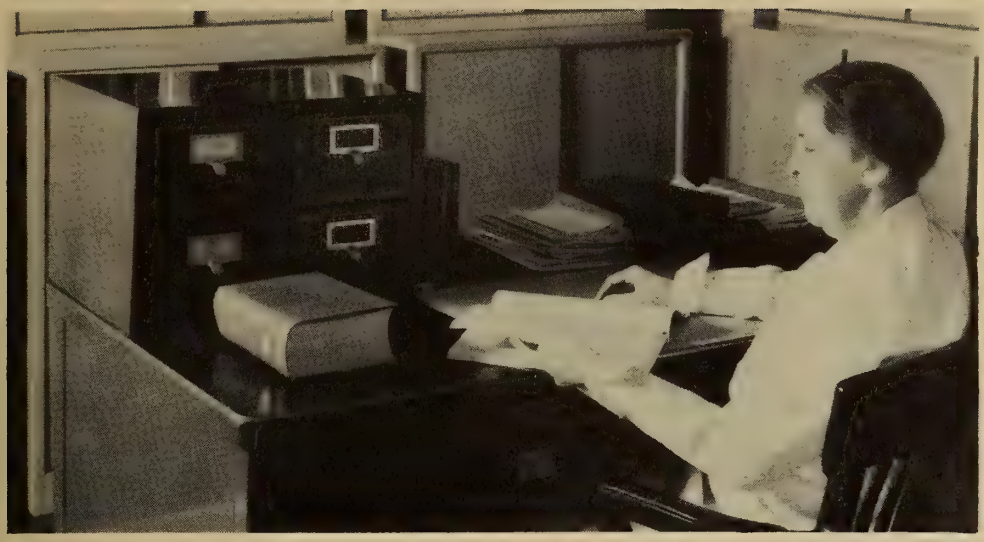
A thorough study of the pharmacological effects of quaternary ammonium salts led Dr. Hunt to the discovery that acetylation of choline enormously increased its activity; this work laid the foundation for the great importance which acetylcholine has assumed in our knowledge of physiological processes.

IDA A. BENGTSON

Ida A. Bengtson was appointed Assistant Bacteriologist at the Hygienic Laboratory in 1916, where she earned the reputation of being a most competent and dependable investigator.

One of her first assignments was to assist Dr. George W. McCoy in the investigation of an outbreak of post-vaccination tetanus. This research led to the detection of *B. tetani* in bone points employed as scarifiers, which finding led to the abandonment of their use and supplied valuable information relative to the incubation period in post-vaccination tetanus. This information was of much assistance to Dr. Charles Armstrong in his later studies which incriminated the use of vaccination dressing. The elimination of dressings over smallpox vaccinations caused the disappearance of post-vaccination tetanus from the United States. Doctor Bengtson's research also dealt with many problems as they arose in the standardization of various biologic products such as *Vibrion septique antitoxin, B. oedematiens antitoxin, B. histolyticus antitoxin, B. perfringens antitoxin,* and others. She participated in international studies which led to the adoption of international standards for these antitoxins.

In 1922 Doctor Bengtson investigated the cause of an outbreak of limberneck in chickens and succeeded in isolating a strain of *B. botulinus*



(From USPHS Records)

Dr. Alice C. Evans

(From USPHS Records)

Dr. Ida A. Bengtson

which was immunologically different from the known A and B strains. This new strain she designated as type "C" and demonstrated its causal relationship to the outbreak.

In the field of trachoma and conjunctivitis Doctor Bengtson also carried on extensive studies. From a type of conjunctivitis prevalent among children in the southern United States, she isolated several strains of bacteria, corresponding to the Koch-Weeks and Morax-Axenfeld bacilli, as well as strains of pleomorphic streptococci.

Doctor Bengtson was the first to cultivate the rickettsia of Rocky Mountain spotted fever and the virus of lymphocytic-choriomeningitis in developing chick embryos. She also cultured the rickettsia of endemic and epidemic typhus fever in tissue culture. From this culture work she developed antigens which permitted her to apply the complement fixation technique to Rocky Mountain spotted fever, endemic and epidemic typhus fever, Q fever and tsutsugamushi. Thus was supplied a very valuable tool for the diagnosis and differentiation of these conditions; it was also of great value in the study of serum from man and rats for the purpose of detecting past infections. The complement fixation reaction, moreover, proved to be of great assistance in the development of an improved type of typhus fever vaccine.

The type of typhus vaccine widely employed among our troops in World War II was made possible by Dr. Herald R. Cox of the Rocky Mountain Laboratory, when he demonstrated that an abundant multiplication of the rickettsia of this disease could be induced in the inoculated yolk sacs of developing chicks, and by the work of the Canadian, J. Craigie and his associates, who developed a method of purifying the yolk sac material by ether extraction. The complement fixation reaction revealed the presence of antigenic substances in the discarded fraction, which was retained in the vaccine which markedly increased its immunizing potency.

Doctor Bengtson retired in 1946.

ALICE C. EVANS

Alice C. Evans began her service with the Government in 1910 when she was appointed a bacteriologist in the U. S. Department of Agriculture. There, her work dealt with the bacteriology of dairy products,

cheese ripening, and the bacteria of the cow's udder. It was there that she, for the first time, recognized the remarkable similarity between the bacillus of contagious abortion of cattle and the bacillus of undulant fever of man. Thus, she established that raw milk from infected cows is a common source of human brucellosis and pointed to a method for its prevention. Naturally, Doctor Evans became one of the outstanding advocates of milk pasteurization in the United States.

In 1918 Doctor Evans was appointed Associate Bacteriologist at the Hygienic Laboratory. While with the Public Health Service, she continued her interest in the brucella group of organisms. In 1923 she inoculated a human strain of organisms into a pregnant heifer which aborted. She recovered the inoculated strain from the fetus, thus further confirming the similarity of human and cattle strains.

Brucella organisms have been isolated from man, cattle, goats, swine, horses, and sheep, and Doctor Evans became much interested in the classification of these different strains, for which purpose she employed the agglutination absorption, tropin, and opsono-cytophagic reactions.

During her studies she contracted brucellosis, and for many years carried on her activities while physically unable to work full time in the laboratory. The diagnosis of chronic brucellosis was established when she underwent a surgical operation at which time, from a removed cyst, a pure culture of brucella organisms was isolated.

Doctor Evans' interest in the classification of the brucella group of organisms led her to a similar interest in the classification of other groups of organisms such as the meningococci and the streptococci. She served on the Committee on Infectious Abortion of the National Research Council, 1925-1930, was chosen a delegate to the Micro-biological Congress in Paris in 1930, and served as National President of the American Society of Bacteriologists in 1928. She also served as President of the Inter-American Congress on Brucellosis.

Doctor Evans retired in 1945.

Special Classes for Instruction

Courses of instruction for officers of the Public Health Service were conducted at the Hygienic Laboratory and its successor, the National

Institute of Health, over a period of many years. Their frequency, duration and scope, and the size of the classes have varied according to the exigencies of the Service both as regards the availability of personnel and of space and teaching facilities at the laboratory. The purpose of the courses was twofold: (1) To develop a body of officers trained in the disciplines of public health as distinguished from those of purely medical or other professional preparation, and (2) to discover officers who by natural inclination and ability seemed to be promising material for research workers. Medical, dental, and engineering colleges have as their main objective the turning out of well prepared practitioners in the rather restricted fields of personal service, or at most through the activities of limited organizations. Adequate preparation for dealing with the public health on a large scale can be provided only by graduate study, and this is what these courses were intended to furnish.

Officers entering the Service were made to understand they would be subject to change of stations, taking the good and bad alike. Their services were to be rendered in a new and specialized field. They had been educated at their own expense for general practice. They had contracted to perform specialized service for which there were no formal schools of preparation. In view of this, the Service regulations had provided for systematic rotation of stations and types of assignment so that all young officers might receive additional training to aid them in the discharge of their duties, including laboratory practice.

There was an unwritten policy relating to the development of efficiency that young officers should be "caught early and treated rough." Its natural corollary was that treatment should be wisely chosen and meted out not as discipline only, but as a means of promoting *esprit de corps.* To this end newly appointed officers were instructed to report to the larger stations and serve with experienced administrators wherever practicable. This policy and practice have accounted for the efficiency and achievements of the majority of all officers in the Service.

Perhaps the most cogent reasons for assignment of officers to student courses were: First, the long-looked-for hope of being so assigned; second, the association with, and receipt of, instruction from an older officer "who had arrived"; and third, every young officer thus had his

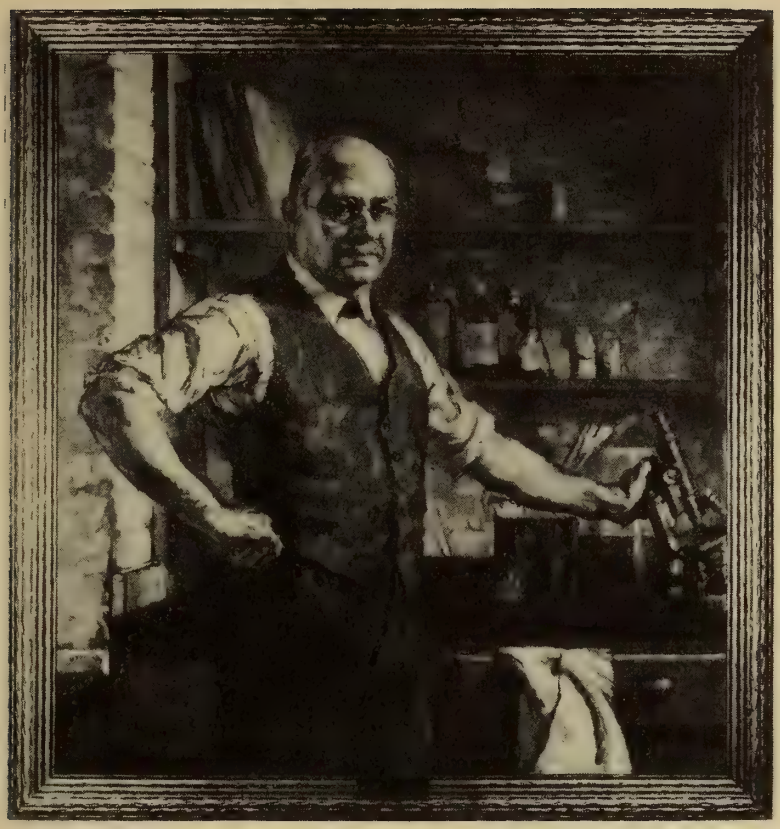
opportunity to ascend the mountain and have pointed out to him a vision of things to come if he had eyes to see and the desire to have a part in them. These reasons were endorsed over the years by some of the wisest members of the Advisory Board of the Hygienic Laboratory.

The courses at their fullest development included a review of significant portions of fundamental sciences including physics, chemistry, bacteriology, parasitology, and related subjects, with bench-work, lectures, and quizzes. Lectures were given on vital statistics and its mathematics, and on ventilation, water purification, and sewage disposal. These were supplemented by visits to plants of various design in actual operation and by observation of the methods of such special campaigns against typhoid fever, hookworm disease, malaria, and other public health problems as might be currently available.

Instruction was given by experienced specialists in each branch, mostly senior officers of the Service. The courses were intensive and kept the student officers fully occupied during laboratory hours, with plenty of assigned reading for their evenings.

The results of the courses amply justified their employment as regards the major objectives. Not only was the ability of the Service to cope with practical problems in the field built up, but a considerable number of especially adapted officers were launched upon productive research careers. Though highly informal at first the courses of instruction were a part of the activities of the Hygienic Laboratory following its removal to Washington. After the turn of the century, the practice became routine. It was interrupted during World War I, but resumed immediately thereafter and continued until the 1930's.

Since 1919 schools of public health have been established at several universities and selected Service officers are now assigned to such institutions for instruction whenever practicable. Instruction offered at schools of public health leads to academic degrees and must, of necessity, be broad and suitable for persons of various professional categories who are or are to be employed by State and local health departments or engage in related activities. The training given at the Hygienic Laboratory was adapted to the needs of Service officers, and therefore was especially effective for Service purposes.



(Portrait by Walmsley Lenhard)

Dr. Joseph J. Kinyoun
First Director, Hygienic Laboratory

Biographical Sketches of the Directors of the National Institutes of Health

JOSEPH JAMES KINYOUN (1860-1919)

Dr. Joseph James Kinyoun introduced the Marine Hospital Service to bacteriology and in the process became the first Director of the Hygienic Laboratory. His interest and follow-through in a new branch of science laid the groundwork for the present program of medical and public health research carried on by the National Institutes of Health.

Doctor Kinyoun was born in East Bend, North Carolina, November 25, 1860. He received his medical degree from Bellevue Hospital Medical College of New York University in 1882 and secured postgraduate training in Europe. Included among his teachers was the great German bacteriologist, Robert Koch.

Back in the United States, Doctor Kinyoun joined the Public Health Service (then the Marine Hospital Service) in 1886. In a one-room laboratory in the Marine Hospital at Stapleton, Staten Island, New York, Doctor Kinyoun set up a microscope and began to apply the new techniques he had learned in Europe to the study of cholera, typhoid fever, and other diseases. The Hygienic Laboratory thus came into being in 1887.

Doctor Kinyoun was responsible for emphasizing research as a basic function of the Service. He served as Director of the Hygienic Laboratory until 1899 when he was transferred to other duty. While in the Public Health and Marine Hospital Service, Doctor Kinyoun designed the Kinyoun-Francis sterilizer, a shipboard disinfecting apparatus used in the quarantine service. Resigning from the Public Health and Marine Hospital Service in 1903, Doctor Kinyoun became Director of the H. K. Mulford Co. Laboratories in Glenolden, Pennsylvania, holding this post until 1907. At that time he became Professor of Pathology and Bacteriology at George Washington University Medical School. (During his directorship of the Hygienic Laboratory he had served as Professor of Hygiene, Bacteriology, and Pathology at Georgetown University from 1890 to 1899.)

In 1909 Doctor Kinyoun gave up a teaching career to become bacteriologist of the District of Columbia Health Department, a post he held until his death February 14, 1919, in Washington.

MILTON JOSEPH ROSENAU (1869-1946)

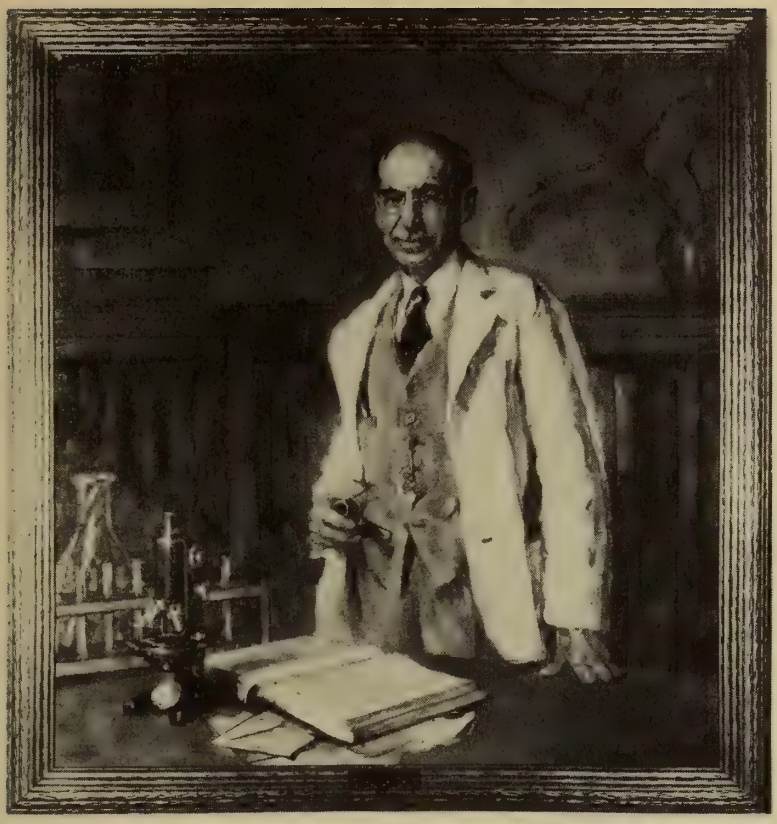
During his 19 years with the Public Health Service, Dr. Milton J. Rosenau made an indelible mark on the work of the Service and the Hygienic Laboratory. As the second Director of the Laboratory, from May 1, 1899, to September 30, 1909, he was responsible for expanding its scope of investigations and for directing the work of the Laboratory during a period of rapid growth. What had started out as a one-man laboratory under Doctor Kinyoun developed under Doctor Rosenau into an organization with its own building, and separate divisions of pathology, bacteriology, chemistry, zoology, and pharmacology. The Biologics Control Law was passed during this period and a separate division was set up within the Laboratory to administer it.

Besides his talents as a planner and administrator, Doctor Rosenau was the author of several important and original studies in the field of public health. With Dr. John F. Anderson, he pioneered in the study of anaphylaxis, and his milk bacteria studies were of fundamental importance to the nation's health. Among his writings are works on antitoxins, yellow fever, malaria, disinfectants, typhoid fever, anaphylaxis, pasteurization of milk, poliomyelitis, and others. Rosenau's "Preventive Medicine and Hygiene" is a standard text used by students of public health.

Doctor Rosenau was born in Philadelphia in 1869. After receiving his medical degree from the University of Pennsylvania, he did postgraduate work in Berlin, Paris, and Vienna in the field of his chief interest—sanitation and public health.

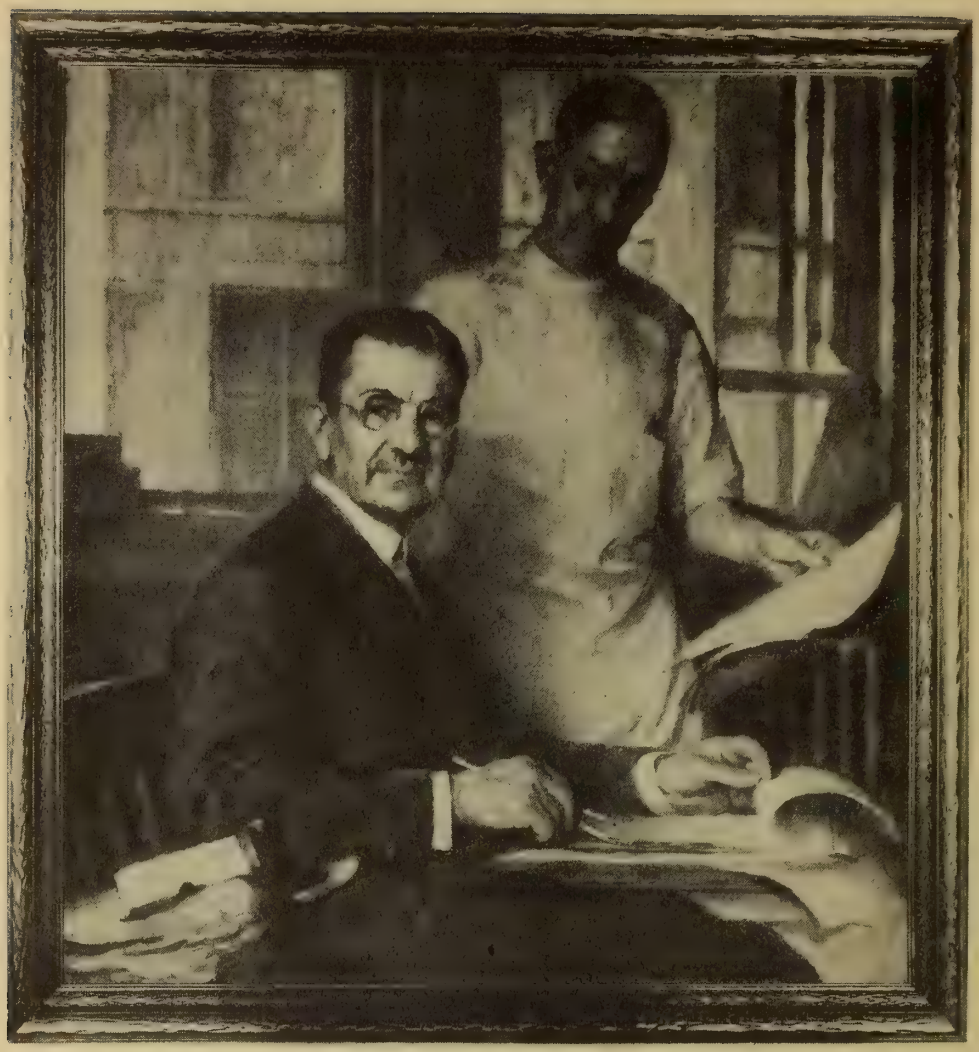
In 1890, he received his commission in the Marine Hospital Service, and he was made Director of the Hygienic Laboratory in 1899.

A long-felt desire to enter the academic field was realized when, in 1909, Doctor Rosenau resigned from the Service to become Professor of Preventive Medicine at Harvard Medical School. He was also appointed Professor of Epidemiology at the Harvard School of Public Health in 1922, and held both posts until 1935. During this period he



(Portrait by Walmsley Lenhard)

Dr. Milton J. Rosenau
Director, Hygienic Laobratory, 1899-1909



(Portrait by Walmsley Lenhard)

Dr. John F. Anderson
Director, Hygienic Laboratory, 1909-1915

served with the Massachusetts State Department of Health as Director of the Antitoxin and Vaccine Laboratory and Chief of its Division of Biologics Laboratories.

In 1936, Doctor Rosenau was called to the University of North Carolina to direct its Division of Public Health. When this department was made a special school, he became Dean and later Director. He remained at North Carolina until his death on April 9, 1946.

Doctor Rosenau served as a member of the National Advisory Health Council of the Public Health Service and as a member of the Science Advisory Board of the National Research Council. He was also a member of the Medical Advisory Board of the American National Red Cross. He was a delegate to many international conferences.

In 1934, Doctor Rosenau was awarded the Sedgwick Memorial Medal of the American Public Health Association for Achievements in Public Health.

JOHN F. ANDERSON (1873-)

Dr. John F. Anderson, third Director of the Hygienic Laboratory, was among the early scientists who made the old Hygienic Laboratory well known in scientific circles. A contemporary of Doctors Goldberger and Rosenau, Doctor Anderson collaborated with them on many important studies.

Doctor Anderson was born in Fredericksburg, Virginia, March 14, 1873. Following medical school at the University of Virginia, he went abroad to study in his chosen field of bacteriology at Vienna, Paris, and the School of Tropical Medicine in Liverpool. On his return to the United States in 1898, he joined the Marine Hospital Service. In 1902, he was made Assistant Director of the Hygienic Laboratory, and in 1909 succeeded Doctor Rosenau to the Directorship.

Throughout his career in the Service, Doctor Anderson was actively engaged in research. Independently, he studied serum and vaccine therapy, immunology, cholera, typhus, poliomyelitis, and public health and sanitation problems. He worked with Doctor Rosenau on tuberculosis, anaphylaxis, and hypersusceptibility, and together they published several important papers on the subjects. With Doctor Goldberger, he collaborated in experiments on the transmission of measles to monkeys,

which provided science with an experimental animal for that disease.

Doctor Anderson's term as Director of the Hygienic Laboratory lasted from October 1, 1909, to November 19, 1915, at which time he resigned from the Public Health Service to become Director of the Research and Biological Laboratories of E. R. Squibb and Sons. In 1919 he was made vice-president of the company and still serves in that capacity.

He has been a frequent guest lecturer at universities—Harvard and Rutgers in particular, and was a professor at Georgetown University during his years with the Public Health Service in Washington.

GEORGE WALTER MCCOY (1876-)

Dr. George Walter McCoy is one of those rare men of science who is equally at home in research and in administration. As the country's top authority on leprosy, his position is undisputed. In the field of administration, his 21 years of directorship—of the Hygienic Laboratory and the National Institute of Health in point of time—are without equal in the history of the Public Health Service.

Doctor McCoy was born in Cumberland Valley, Pennsylvania, in 1876, and after graduation from the University of Pennsylvania Medical School entered the Marine Hospital Service in 1900. His first assignment was in the Marine Hospital in San Francisco and it was there that he became interested in leprosy. After a brief two-year detail at the Hygienic Laboratory in Washington, Doctor McCoy spent 13 years on field projects on the West Coast and in Hawaii. From 1908 to 1911 he was Director of the U. S. Plague Laboratory in San Francisco, and it was during this period that he discovered that the California ground squirrel was responsible for the spread of the organism causing a "plague-like disease." McCoy and Chapin reported the cultivation of the causative organism, now known to be the cause of tularemia. From 1911 to 1915 he served in the leprosy colony in Hawaii as Director of the Leprosy Investigation Station. In 1915 he was called to Washington as Director of the Hygienic Laboratory.

The years from 1915 to 1937 were years of tremendous growth for the Hygienic Laboratory, and Doctor McCoy, as Director, took an active part in building it up into a well-recognized research organization. In 1930 the Hygienic Laboratory was reorganized under the Ransdell Act,

(From USPHS Records)

Dr. George W. McCoy
Director, Hygienic Laboratory, 1915-1937

(From USPHS Records)

Dr. Lewis R. Thompson
Director, National Institutes of Health, February 1, 1937,
to January 31, 1942.

given additional functions, and renamed the National Institute of Health. Doctor McCoy continued to serve as Director until February 1937.

Throughout this period, a good share of Doctor McCoy's time was spent in active research. In line of duty, he contracted typhoid, tularemia, and dengue fever. Independently, he conducted important studies in influenza, poliomyelitis, smallpox, tularemia, amoebic dysentery, and pneumonia. In 1932, as a member of a board to make a special leprosy investigation he went back to Hawaii for a short period.

In February 1937, Doctor McCoy was assigned to full-time work in his favorite field of research, leprosy, and conducted a nationwide epidemiological survey of that disease. He retired from the Public Health Service on June 30, 1938, and accepted the post of Professor of the Department of Public Health and Preventive Medicine at Louisiana State University in New Orleans. Because of the University's proximity to Carville Hospital, he was able to combine his academic duties with independent research on leprosy. Since 1947, he has held the title of Professor Emeritus.

Among his many professional honors, Doctor McCoy is inclined to value most highly the Sedgwick Memorial Medal of the American Public Health Association for distinguished service, which he received in 1921, and his selection as Cutter Lecturer at Harvard in 1915. He has served as a member of the Public Health Special Advisory Committee on Leprosy, the Standards Commission of the League of Nations, and the Council on Pharmacy and Chemistry of the American Medical Association.

He is the author of many important papers of which his writings on leprosy and plague are especially noteworthy.

LEWIS RYERS THOMPSON (1883-)

A long career in the Public Health Service prepared Dr. Lewis R. Thompson for his most important work, that of serving as head of the research activities of the Service.

Born in Lafayette, Indiana, August 6, 1883, Doctor Thompson received his medical education at Louisville Medical College. He joined the Public Health Service in 1910 and for the next 20 years served on

assignments of increasing responsibility until in 1930 he was made Chief of the Division of Scientific Research.

For 10 years prior to this date he had ably directed the work of the Office of Industrial Hygiene and Sanitation. Doctor Thompson was personally most interested in research on the problems of stream pollution and of health in industry. In this period he was the principal author of a number of monographs dealing with investigations of health hazards in industry. Especially well known is the series of *Public Health Bulletins* on the health of workers in dusty trades.

Upon being placed in charge of research activities of the Service, he was responsible for the administration of field investigations of stream pollution, malaria, cancer, nutritional diseases, child hygiene, milk, dental studies, industrial hygiene, and biometrics. The principal research laboratory of the Public Health Service, the National Institute of Health, was administered under Doctor Thompson's general supervision.

During his tenure of office, the research authority of the Service was broadened, the program expanded, and the research facilities greatly increased.

In 1937 the Division of Scientific Research was merged with the National Institute of Health, the name National Institute of Health being retained, and Doctor Thompson became its director.

In 1935, Mr. Luke I. Wilson, a prominent citizen of Bethesda, Maryland, addressed a letter to the President stating that it was Mr. Wilson's desire to give 45 acres of land to the Government to be used as the site of some institution for the general good of the people of the country. Copies of this letter were referred by the White House to the various departments.

For several years prior to this time Dr. Lewis R. Thompson had been trying to secure funds and a location for an animal farm where animals might be raised for use in experimental work at the National Institute of Health, and especially for the biologics control work. When the copy of Mr. Wilson's letter to the President reached the Treasury Department, it was immediately referred to the Public Health Service, as it was known that Congress had recently appropriated $100,000 for the erection of buildings for an animal farm for the Service.

At Surgeon General Cumming's direction, Doctor Thompson drafted a memorandum for the President indicating that the Public Health Service was in great need of a location for an animal farm and emphasizing the importance of expanding research in relation to the prevention of human disease. In the meantime, Surgeon General Cumming arranged an interview with Mr. Wilson. At this and succeeding interviews with Mr. and Mrs. Wilson, Doctor Thompson soon secured their deep interest in medical research. The initial gift was 45 acres of land near their residence about a mile north of Bethesda, Maryland. With such a splendid site available and in view of the fact that the location of the National Institute of Health at 25th and E Streets, N.W. was quite crowded, the plans of the Public Health Service for enlarging the National Institute of Health on the old site were changed. After Mr. Wilson's death in 1937, Mrs. Wilson and her son became greatly interested in the project and from time to time gave additional lots of land until the amount donated totaled about 90 acres. This included several cottages and other buildings on the estate.

The present site of the National Institutes of Health was therefore acquired through the generosity and understanding of two fine public-spirited citizens, Mr. and Mrs. Luke I. Wilson, and later their son and his wife.

To Doctor Thompson, for his able presentation of the tremendous possibilities of a great medical research institution, goes much of the credit for securing the appropriation of funds for the erection of the first six buildings housing the National Institute of Health. Under his guidance, the first of the new buildings was ready for occupancy and headquarters were established in the latter part of 1938.

Doctor Thompson continued as Director of the National Institute of Health until 1942. With the reorganization of the Public Health Service in 1943, Surgeon General Parran selected Doctor Thompson to become the first Chief of the Bureau of State Services, which place he held until retirement for physical disability in 1947.

Doctor Thompson served a term as one of the scientific directors of the International Health Division of the Rockefeller Foundation; he also served as a member of the Division of Medical Sciences of the National Research Council.

ROLLA EUGENE DYER (1886-)

Dr. Rolla Eugene Dyer's first assignment for field work on bubonic plague in New Orleans in 1916 was the beginning of an outstanding career in the Public Health Service. It culminated in his service as Director of the National Institute of Health and Assistant Surgeon General of the Service from 1942 to 1950.

Doctor Dyer was born in Delaware County, Ohio, on November 4, 1886, the son of a clergyman. He received his Bachelor of Arts degree from Kenyon College, Gambier, Ohio (he later received an honorary LL.D. from Kenyon); and his M.D. from the University of Texas. In 1916 he became a commissioned officer of the Public Health Service.

After five years of field work on plague and influenza control and pellagra studies, he joined the staff of the Hygienic Laboratory, where he served as Assistant Director from 1922 to 1942. He became Chief of the Division of Infectious Diseases in 1936, serving in that capacity until he succeeded Dr. Lewis R. Thompson as Director of the National Institute of Health.

Doctor Dyer's major research contributions have been in the area of infectious diseases. His most important single contribution was his work on endemic typhus. Taking up where Dr. Kenneth F. Maxcy left off in 1929, Doctor Dyer found the agent for endemic typhus in the common rat flea. After showing that the disease is spread to man and animals by fleas, he worked on a vaccine to protect against typhus. Doctor Dyer did important work on other rickettsial diseases, particularly Q fever and Rocky Mountain spotted fever, and also on scarlet fever and pellagra.

In addition to having a distinguished research career, Doctor Dyer has actively participated in the formation of major Federal medical research policies and has administered the work of a major Federal research organization. He organized and developed the Research Grants and Fellowships Division of the National Institutes of Health, which administers the important and extensive research grants program and the research fellowship program of the Public Health Service.

He furnished leadership in the reorganization and expansion of other parts of the National Institutes of Health program, including these:

(From USPHS Records)

Dr. R. Eugene Dyer
Director, National Institutes of Health, 1942-1950.

(From USPHS Records)

Dr. William H. Sebrell, Jr.
Appointed Director, National Institutes of Health, 1950.

The setting up of three new Institutes created by Acts of Congress, the National Heart Institute, the National Institute of Dental Research, and the National Institute of Mental Health; the realignment of a number of divisions to form the Experimental Biology and Medicine Institute and the Microbiological Institute; and the planning of the new Clinical Center, now under construction (1950) which will provide for the integration of fundamental and clinical research on cancer, heart disease, mental diseases, and certain infectious and tropical diseases.

Doctor Dyer retired from active duty on October 1, 1950, having reached the statutory age for retirement.

Doctor Dyer served a term as a member of the Scientific Board of Directors of the International Health Division of the Rockefeller Foundation and was a member of the Committee on Medical Research of the Office of Scientific Research and Development from 1942 to 1947. He delivered the Kober lecture of the Association of Military Surgeons in 1932, the Harvey lecture of the New York Academy of Medicine, and the De Lamar lectures of Johns Hopkins University in 1933.

Doctor Dyer received the Carlos J. Finlay Medal, Cuba, 1944; the U.S.A. Typhus Fever Commission Medal, 1944; the Lasker Award, presented by the American Public Health Association, 1948; the Sedgwick Medal of the American Public Health Association in 1950; the Walter Reed Medal of the American Society of Tropical Diseases in 1950; and the James D. Bruce Medal of the American College of Physicians in 1950.

WILLIAM HENRY SEBRELL (1901-)

Dr. William Henry Sebrell was appointed as Director of the National Institutes of Health in October 1950. A leading international authority on nutrition, his knowledge has been put to public use not only in the United States but in foreign countries.

Born in Portsmouth, Virginia, in 1901, Doctor Sebrell received his Medical Degree from the University of Virginia. Immediately after graduation he entered the Commissioned Corps of the Public Health Service in 1926 as an Assistant Surgeon.

He began his research career under Dr. Joseph Goldberger who demonstrated that pellagra is a dietary deficiency disease. After Goldberger's death in 1929, Doctor Sebrell continued to work on pellagra and branched out into the general field of nutrition research. Studying the vitamin B complex, he has made many important contributions to the knowledge of dietary needs and deficiencies.

Doctor Sebrell first recognized and described the dietary deficiency disease ariboflavinosis. He also has made important contributions on the role of diet in cirrhosis of the liver, and on the anemias.

While head of the Laboratory of Physiology, Doctor Sebrell was appointed Director of the Experimental Biology and Medicine Institute which was formed in 1948 by a consolidation of several existing laboratories at the National Institutes of Health.

His work during the war and postwar period was of considerable national and international importance. He acted as co-director with Mr. Milburn L. Wilson of the Department of Agriculture, of the National Nutrition Program which coordinated the activities of all State agencies working in the field of nutrition during World War II. This program materially aided food production and the maintenance of civilian health during the war years.

Temporarily assigned to the U. S. Army in 1945, he assisted in developing a system for determining the nutritional status of civilians in occupied Germany. He served as an expert on the survey team which restudied nutrition in Germany in 1948.

Doctor Sebrell had a part in drawing up the first international standards of nutrition for the League of Nations and has made other important nutritional surveys for various governments and international organizations, such as the Pan American Sanitary Bureau. He has pioneered in gaining acceptance of scientific nutrition as a regular function of modern State and local health departments in this country.

In recognition of his research achievements, Doctor Sebrell has received the Mead-Johnson Award of the American Institute of Nutrition, and the Research Medal of the Southern Medical Association. For his work in Germany, he received the Army Legion of Merit. He is a member of the National Research Council.

CHAPTER V

Field Studies and Demonstrations in Public Health

Life is short and art is long, the occasion fleeting, experience fallacious and judgment difficult.—HIPPOCRATES

Extrinsic Incubation Period of Yellow Fever

OBSERVATIONS in 1898 by Dr. Henry R. Carter* of the Marine Hospital Service had a profound bearing on the final determination of the role of the *Aedes aegypti* mosquito in the transmission of yellow fever. After entering the Marine Hospital Service in 1879, Doctor Carter spent a great deal of time studying and working in epidemics of yellow fever. In 1898 Doctor Carter, in a brilliant epidemiological study, discovered the extrinsic incubation period of yellow fever. A certain time elapses from the date the mosquito feeds on the sick person before the mosquito can transmit the infection. This interval is called the period of extrinsic incubation. Doctor Carter showed this period as being not less than 12 days. This work of Doctor Carter on yellow fever was a model of patient investigation, clear thinking, and exact deduction. It is interesting to note that as early as 1848, Dr. Josiah C. Nott of Mobile, Alabama, reasoned from certain epidemic peculiarities of yellow fever that it is "probable that yellow fever is caused by an insect or animalcule bred on the ground." He mentions mosquitoes, flying ants, and many of the aphides. While the theories and work of Dr. Carlos Finlay of Cuba in the early 1880's had pointed to the mosquito as the carrier of yellow fever, the discovery of the extrinsic incubation period for yellow fever by

*Doctor Carter was a native of Virginia. He received a degree in civil engineering at the University of Virginia. His medical degree was obtained at the University of Maryland in 1879. He retired in 1920. Doctor Carter died in Washington, D. C., September 14, 1925.

Doctor Carter had much to do with showing Dr. Walter Reed the way for his important work.

Doctor Carter's important observations on the extrinsic incubation period of yellow fever were made during an epidemic of that disease at Orwood and Taylor, Mississippi, in 1898. In the Annual Report of the Marine Hospital Service for 1900, these observations are placed on record by Doctor Carter in a "Note on the Spread of Yellow Fever in Houses—Extrinsic Incubation." They were also recorded in the *New Orleans Medical and Surgical Journal* for May 1900.

On June 26, 1900, Doctor Carter sent a note and memorandum to Dr. Jesse W. Lazear, who died of yellow fever at Columbia Barracks in Cuba on September 25, 1900, expounding his conception of extrinsic incubation. This note reads as follows:

Dear Doctor Lazear:

I think that this is about the argument I made to you yesterday and which you can, naturally, examine better when written out. As I said; to me the a-priori argument for Dr. F's [Finlay] theory has much in its favor and to me is more than plausible, although his observations as I read them are not convincing, scarcely corroborative. I pin this on the pamphlet which I will ask you to return as I have no other. Also appended a more readable "list of hours."

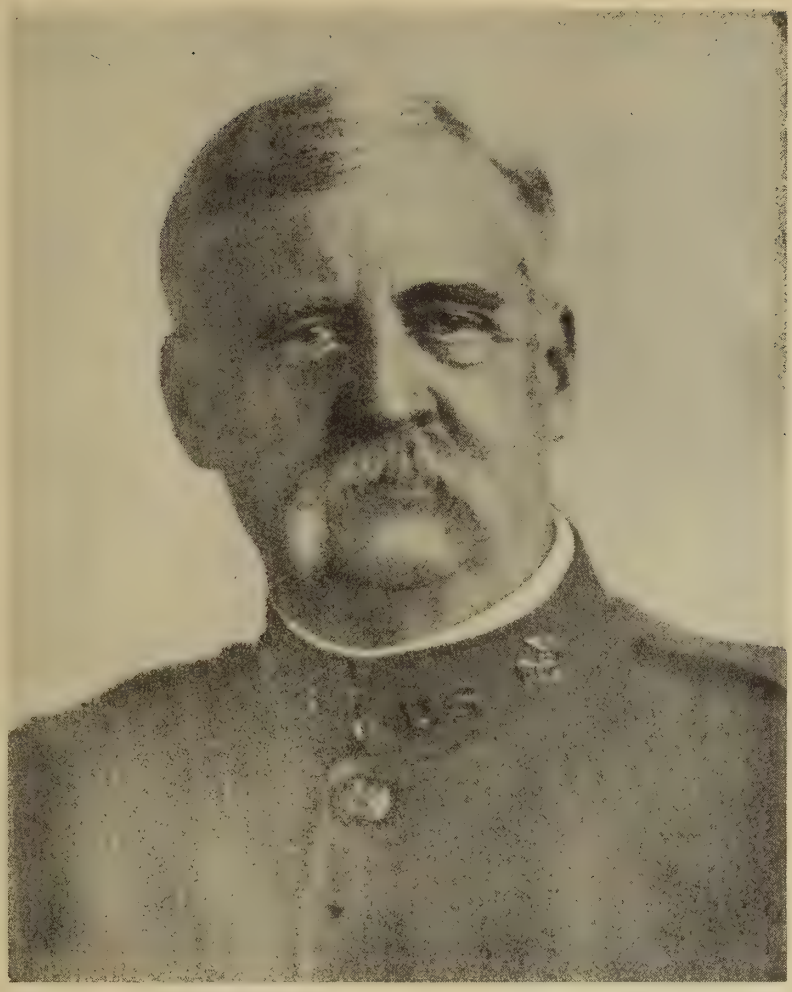
Salebes, I suppose, is gone?

H. R. Carter

On the page of his manuscript shown facing page 261, Doctor Carter explained his conception of the period of extrinsic incubation, but evidently felt that the material should not be printed and therefore marked the paragraphs "omit." However, the observations, in the light of later findings, were quite correct.

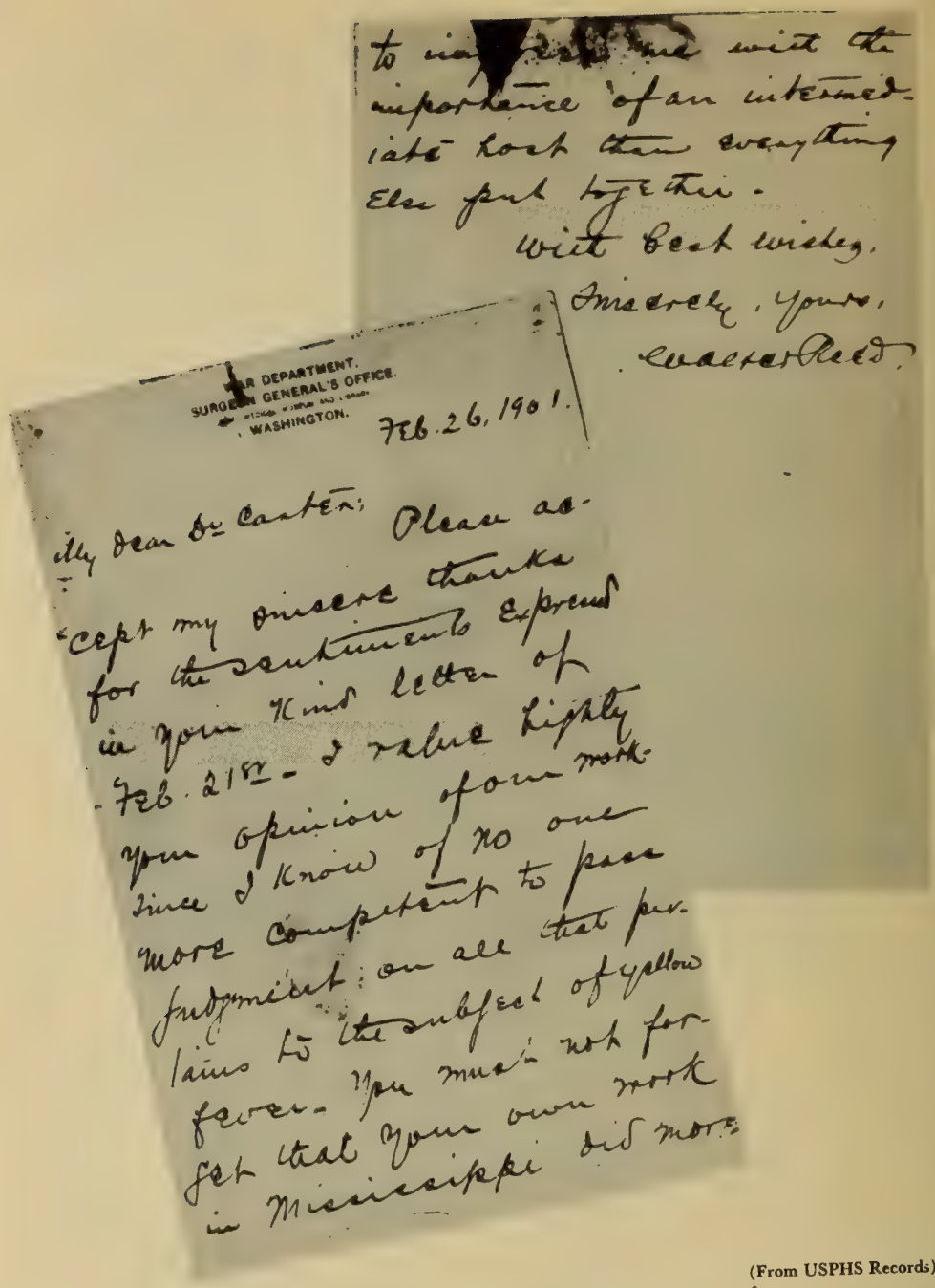
Dunham and Myers of the Liverpool School of Tropical Medicine, in their article of September 8, 1900, in the *British Medical Journal,* said, "Of the interesting and important facts which have been ascertained, those illustrated by Doctor Carter are second to none."

In the article, "The Etiology of Yellow Fever, A Preliminary Note," by Dr. Walter Reed and his associates, which appeared in the *Proceedings of the Twenty-Eighth Annual Meeting of the American Public Health Association,* October 1900, these writers were "much impressed by the valuable observations made at Orwood and Taylor, Mississippi,



(From USPHS Records)

Dr. Henry R. Carter



to ma[illegible] with the importance of an intermediate test than everything else put together.

With best wishes,

Sincerely, Yours,

Walter Reed.

WAR DEPARTMENT,
SURGEON GENERAL'S OFFICE,
WASHINGTON.

Feb. 26, 1901.

My dear Dr Carter: Please accept my sincere thanks for the sentiments expressed in your kind letter of Feb. 21st - I value highly your opinion of our work since I know of no one more competent to pass judgment: on all that pertains to the subject of yellow fever. You must not forget that your own work in Mississippi did more

(From USPHS Records)

Dr. Walter Reed thanks Dr. Carter.

this subject as there is an allusion to a subject involved in it "Extrinsic Incubation" of yellow fever in one of his lesser works. The writer has been unable to see the work alluded to (also one of Corre) and at present has access only to his own notes.

Obiter Dicta:

The fact that yellow fever is not directly transferable from the sick tothe well, but is indirectly transferable through an environment infected by the patient is held to be due to the fact that the material leaving the person of the patient must undergo, and does undergo, some change in the environment before it is capable of infecting another man.

The time required for this change is evidently the "interval required from the development of the infecting case until the environment is capable of developing infection among other men" i. e. the time of "extrinsic incubation." Of the nature of this change nothing is predicated--

(a) it may be a change in the physical state of the excretion infecting the environment, as when the sputum of tuberculosis must become dry and pulverulent before it produces infection of other people; (b) it may be transmitted only by a host primarily infecting it--said host (analogous to the tick of the Texas Cattle Fever or (c) that the form of the organism when it left the person of the patient, was incapable of producing infection, but, under proper conditions, was capable of such change of development that it became capable of infecting man. For this I know of no analogy in any other pathogenic microorganisms.

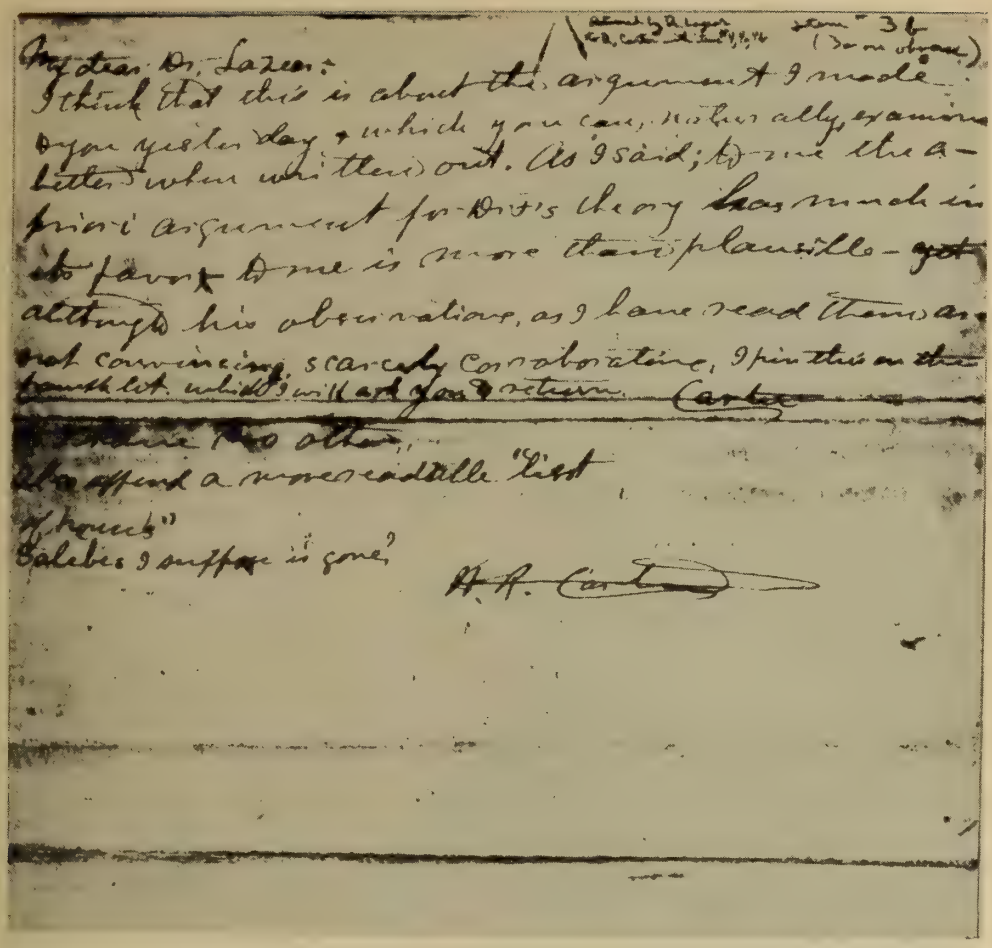
The fact that yellow fever is not directly transferable from the sick to the well but is indirectly transferable through an environment infected by the patient is held to be due to the fact that the material leaving the person of the patient must undergo, and does undergo, some change in the environment before it is capable of infecting another man. The time required for this change is evidently the time required from the development of the infecting case until the environment is capable of developing infection among other men, i.e., the time of "Extrinsic incubation."

Of the nature of this change nothing is predicated - it may be a change in the physical state of the excretion infecting the environment, as when the sputum of tuberculosis cases becomes dry and pulverulent before it produces infection of other people. That it may be transmitted only by a "host" primarily infecting it - said "host". Analogous to the transmission of malaria.

~~This last, to my mind, has something to commend it.~~

That the specific microorganisms when it left the person of the patient, was incapable of producing infection in man, but, under proper conditions, was capable of such change of development that it became capable of infecting man. For this I know of no analogy in any other pathogenic microroganisms.

(over.



My dear Dr. Lazear:
I think that this is about the argument I made
to you yesterday, which you can, rather ally, examine
Letter when written out. As I said; to me the a-
priori argument for Dr's theory has much in
its favor & me is more than plausible - but
although his observations, as I have read them are
not convincing, scarcely corroborating, I pin this on the
bandwagon which I will add your return. Carter

Enclosure No other
also appeal a more readable "List
of Insects"
Caleb: I suppose is gone?

H. H. Carter

(From USPHS Records)

Memorandum from Dr. Carter to Dr. Lazear.

American Public Health Association

THE ETIOLOGY OF YELLOW FEVER—A PRELIMINARY NOTE.

By WALTER REED, M. D., Surgeon, U. S. A.;
JAMES CARROLL, M. D.; A. AGRAMONTE, M. D., and
JESSE W. LAZEAR, M. D.,
Acting Assistant Surgeons, U. S. A.

Reprinted from the Proceedings of the Twenty-eighth Annual Meeting, held at Indianapolis, Ind., October 22, 23, 24, 25 and 26, 1900.

COLUMBUS, OHIO:
THE BERLIN PRINTING COMPANY.
1905.

(From USPHS Records)

Dr. Walter Reed mentions observations by Dr. Carter in Mississippi as being of assistance to him.

II.

The Mosquito as the Host of the Parasite of Yellow Fever.

Having failed to isolate B. icteroides either from the blood during life or from the blood and organs of cadavers, two courses of procedure in our further investigations appeared to be deserving of attention, viz., first, a careful study of the intestinal flora in yellow fever in comparison with the bacteria that we might isolate from the intestinal canal of healthy individuals, in this vicinity, or of those sick with other diseases; or, secondly, to give our attention to the theory of the propagation of yellow fever by means of the mosquito,—a theory first advanced and ingeniously discussed by Dr. Carlos J. Finlay, of Havana, in 1881, (Anales de la Real Academia, Vol. 18, 1881, pp. 147-169).

We were influenced to take up the second line of investigation by reason of the well known facts connected with the epidemiology of this disease and, of course, by the brilliant work of Ross and the Italian observers in connection with the theory of the propagation of malaria by the mosquito.

We were, also, much impressed by the valuable observations made at Orwood and Taylor, Miss., during the year 1898, by Surgeon Henry R. Carter, U. S. Marine Hospital Service. A note on the interval between infecting and secondary cases of yellow fever, etc. (Reprint from New Orleans Medical Journal, May, 1900). We do not believe that sufficient importance has been accorded these painstaking and valuable data. We observe that the members of the yellow fever commission of the Liverpool School of Tropical Medicine, Drs. Durham and Meyers, to whom we had the pleasure of submitting Carter's observations, have been equally impressed by their importance (British Medical Journal, September 8, 1900, pp. 656-7).

The circumstances under which Carter worked were favorable for recording with considerable accuracy the interval between the time of arrival of infecting cases in isolated farm-houses and the occurrence of secondary cases in these houses. According to Carter "the period from the first (infecting) case to the first group of cases infected, at these house, is generally from two to three weeks."

during the year 1898 by Surgeon Henry R. Carter, U. S. Marine Hospital Service."

In March 1901, Doctor Carter published another article in the *Medical Record of New York* entitled "The Period of Incubation of Yellow Fever: A Study From Unpublished Observations," which contained painstaking epidemiological observations.

In the June 15, 1901 issue of the *Medical Record of New York,* Doctor Carter published additional observations under the title "A Note on the Spread of Yellow Fever in Houses: Extrinsic Incubation."

Under date of February 26, 1901, Doctor Reed acknowledged his indebtedness to Doctor Carter for pointing out the period of extrinsic incubation which made it possible definitely to incriminate the mosquito as the carrier of yellow fever, as will be seen from the note (facing page 262) from Doctor Reed to Doctor Carter.

Puerto Rico Anemia Commission

Dr. Walter W. King of the Marine Hospital Service was assigned to duty in Puerto Rico in 1901, and shortly thereafter was appointed Chief Quarantine Officer for the Island.

Soon after arriving in Puerto Rico, Doctor King came to know and worked with Assistant Surgeon Bailey K. Ashford of the Medical Corps of the United States Army. Dr. Charles Wardell Stiles first identified the new world species of the hookworm, an intestinal parasite, and gave it the name *uncinariasis americana;* later when it was demonstrated that hookworm disease was quite prevalent in the Southern states, the name *necator americana* (American murderer) was suggested. Doctors King and Ashford had noted that many native Puerto Rican patients under their care had a pronounced anemia. They began to investigate the possibility that this anemia was caused by the presence of the American species of hookworm. They demonstrated that hookworm disease was present in Puerto Rico and that the anemia noted by them was due to the presence of these intestinal parasites.

In 1904, Governor William H. Hunt of Puerto Rico requested that Doctor King be permitted to serve as a member of the newly-created Puerto Rico Anemia Commission. Approval for this was given by Sur-

geon General Wyman. Doctor King, Doctor Ashford, and Dr. Pedro Gutierrez of Puerto Rico composed the Commission. The legislative assembly of Puerto Rico appropriated the sum of $15,000 for its work, which was begun on March 1, 1904. Much of the equipment for undertaking this study was loaned by the military authorities in San Juan. The location selected for the first camp was at Baymaon, Puerto Rico, near the city hospital where the laboratory work was done. This first camp consisted of 10 tents, making 48 beds available. The diagnosis was corroborated by microscopic examination of the stools. Upon confirmation of the diagnosis, the patients were admitted for treatment. Thymol was usually given.

As the work of the Commission progressed, various parts of the Island were visited where clinics for examination and treatment of hookworm disease were conducted.

This important work on anemia in Puerto Rico showed conclusively the presence of hookworm disease on that Island and demonstrated methods, some of which were later adapted for use in the campaign for the eradication of hookworm disease in the southern States.

Doctor King was authorized to leave the quarantine station as necessary in connection with his work with the Commission. In 1906 Doctor King was relieved from further duty in Puerto Rico and assigned to investigations of spotted fever in the Bitter Root Valley in Montana.

Laboratory and Field Studies in Plague Control

A plague laboratory was established in the Chinatown area in San Francisco early in 1901 and was continued until April 1905 when it was closed. With the recrudescence of plague in San Francisco in 1907, the laboratory was re-established in that city. It has been in continuous operation since that time. Similar laboratories were established during plague outbreaks in the various cities where that disease has occurred: Seattle, Washington, 1907; Los Angeles, California, 1908; San Juan, Puerto Rico, 1912; New Orleans, Louisiana, 1914, 1919, 1924; Pensacola, Florida, 1920; Galveston, Texas, 1920; Beaumont, Texas, 1920; Los Angeles, California, 1924. Several worthwhile scientific contributions have come from the plague laboratories since the first was established almost 50 years ago.

It was while at the San Francisco laboratory (1907-1911) that Dr. George W. McCoy confirmed the findings of the British Commission for the Investigation of Plague in India regarding the role of the rat flea in the spread of plague. This was highly important and laid the scientific basis for further anti-plague programs of the Service. Studies on fleas were also undertaken at this laboratory somewhat later by Dr. Carroll Fox, who subsequently wrote a textbook on insects.

A resolution was approved on February 6, 1904, by Federal, State, and city health authorities meeting with the finance committee of the San Francisco Board of Supervisors and representatives of mercantile organizations. In part, this resolution read:

> Resolved that all cellars, basements, and underground places in the district between California and Pacific, Stockton, and Kearny, be condemned as places of abode and the same be destroyed; that in case of reconstruction the owners be required to remove surface soil and to concrete the area thus exposed solidly from wall to wall.

Under the authority granted by this resolution, many insanitary structures in San Francisco were demolished and all wooden floors in basements of 22 city blocks were destroyed. This cementing of cellars and basements in the Chinatown area of San Francisco was devised at the time as a means of removal of presumably plague-infected wood and substitution of a non-infectible material, such as cement.

The woodwork in cellars and basements "was so saturated with germ-laden filth to such an extent that purification could be attained only by summary removal and destruction by burning" and "owners were required to cement ground area before occupation of place"; also, that "firing of soil has been practiced in view of theory of existence of the plague bacillus in soil."

RATPROOFING IS DEVELOPED

While this procedure was not then regarded as a ratproofing measure but was devised solely for the purposes of "sealing in the infection" and substituting a non-infectible material, such as cement, for wood which at that time was thought to be infectible, it was effective as an anti-rat measure, though the reason for its effectiveness was not known.

With the reappearance of plague in San Francisco and the second control campaign of 1907-1908, the city was divided into 13 districts and a medical officer placed in charge of each. Among the medical officers who served with Dr. Rupert Blue in this campaign were Dr. Richard H. Creel and Dr. Charles W. Vogel. Doctor Creel was in charge of District No. 1, which included part of the Chinatown area. His office was in a small frame cottage located in Portsmouth Square, one of those that had been provided in large numbers by the Red Cross subsequent to the earthquake and fire. These cottages were placed in many city squares, parks, and other areas. They were close to the ground, resting on mud sills. Shortly after occupying his office, Doctor Creel noticed rat infestation under floors and, recalling that when a boy in Missouri he had heard his parents talk of farmers who had protected corn in cribs from depredation of rats by elevating the cribs on posts, he had his office (cottage) elevated and promptly was rid of the rats.

About that time cases of plague were occurring in Lobos Square in San Francisco, a colony of some 750 cottages constructed for homeless families following the earthquake and fire in 1906. Upon the occurrence of each case, the area was saturated with carbolic acid solution, as well as the interiors of infected houses and environs, such as was done in the 1900-1904 era, but cases continued to occur.

Doctor Blue, Doctor Creel, and Doctor Vogel were living at the "Little St. Francis" hotel, a one-story, temporary structure on Union Square. It was their custom to have dinner together and discuss affairs of the day. Doctor Creel told Doctor Vogel, who was in charge of District No. 4 which contained Lobos Square where cases of plague were then occurring, that he was sure elevation of the houses would rid the area of rats and would result in the cessation of cases.

Subsequent to Doctor Creel's suggestion to Doctor Vogel that the elevation of the cottages in Lobos Square would be effective against the spread of plague there, Doctor Blue inquired of Doctor Creel why he thought this would be effective. There was discussion and, as a result, Doctor Blue directed that the cottages in Lobos Square be elevated. No more cases of plague occurred in that area. The elevation of buildings for such purposes was patterned after the procedure of protecting corncribs in the Midwest, as practiced in the 1870's and 1880's.

This was the beginning of ratproofing by elevation which was instituted thenceforward as a routine and gave impetus to structural changes in buildings as a means of excluding rats. Throughout October, November and December of 1907, Doctor Blue, Dr. Colby Rucker, and various other officers added suggestions, and the ratproofing of bakeries, markets, and stables followed prior to and leading up to the enactment of a ratproofing ordinance in January or February of 1908.

Ratproofing by elevation of buildings and installing concrete floors and walls was mainly effective against the large gray rat (Norway), but of limited value against the black rat (Rattus) and the white-bellied brown rat (Alexandrinus) that harbor in double walls and ceilings and stored contents. Dr. Friench Simpson was active in developing methods for the exclusion of the black and brown rats, especially the use of metal flashing.

The development of ratproofing as a means of excluding rats from buildings, curtailing their propagation, and aiding in the control of plague was initiated in September 1907 and evolved by officers of the Service during the plague campaign in San Francisco in 1907 to 1909.

During the remainder of the second San Francisco epidemic of 1907-1908, well organized anti-rat activities were carried on, and ratproofing was authorized by a series of city ordinances. Ratproofing by elevation was used extensively. Rat infestation declined notably around buildings raised 18 inches above the ground level. Fumigation and disinfection still played a part but were secondary to trapping, poisoning, destruction of rat harborage, rat stoppage, and ratproofing.

Ratproofing activities played an important role in all subsequent plague outbreaks in which the Public Health Service had a hand; in Seattle, 1907; in Puerto Rico, 1912; in New Orleans, 1914 and 1919; in Beaumont, Galveston, and Pensacola, 1920; and in Los Angeles in 1924. Later on in the 1930's these methods were used successfully in anti-typhus programs as well as being applied in general anti-rat control programs.

LABORATORY DIAGNOSIS OF PLAGUE-INFECTED ANIMALS

In every anti-plague campaign in this country, since and including the second San Francisco epidemic, one of the important features has been the laboratory diagnosis of plague-infected animals.

During the second San Francisco epidemic, the accepted procedure was to perform an autopsy on a rat and inoculate a guinea pig with portions of the rat's organs, if suspected pathology were present. It was the consensus that macroscopic examination alone was sufficient to ascertain all positive or suspected plague-infected rats.

In 1914, in Seattle, Dr. Bolivar J. Lloyd of the Service instituted a method which precluded missing any plague rats at all. The daily catch of rats was divided into lots, and a small piece of spleen was removed at autopsy from each rat. These were pooled, ground up, and inoculated into guinea pigs, one pig for each lot of rats. By this method many infections were determined which would otherwise have been missed. The usefulness of this method was emphasized by the later observations of Dr. Charles L. Williams, Sr., and Dr. Theodore W. Kemmerer who published a paper on "Plague Infected Rats Without Visible Lesions" (Pub. Health Rep. 38:1873, 1923).

Animal inoculation with suspected tissue remained as an integral part of the laboratory diagnosis of plague-infected animals for many years, even after the discovery of the infection of the California ground squirrel in 1908, and the inauguration of widespread anti-plague activities throughout California in the period beginning in 1909. It is comparatively simple to autopsy and examine rats brought into a laboratory located in the city where an anti-plague campaign is going on. However, when field activities against wild rodents are being carried on in territory far removed from the laboratory, then the problem arises of getting animal carcasses or tissue to the laboratory before putrefaction sets in. For many years it was standard operating procedure to express squirrel carcasses to the laboratory in large, tightly closed cans. The number of putrified animals was quite large and the task of the persons doing the autopsies in the laboratory was not always pleasant, especially during the summer months. This method has largely been replaced by inoculation of laboratory animals with ectoparasites from rodents whose tissues would formerly have been used.

Until 1934, the distance between the site of field operations and the laboratory was never more than 300 or 400 miles because wild rodent plague was unknown outside of California. Then in 1934, a human death

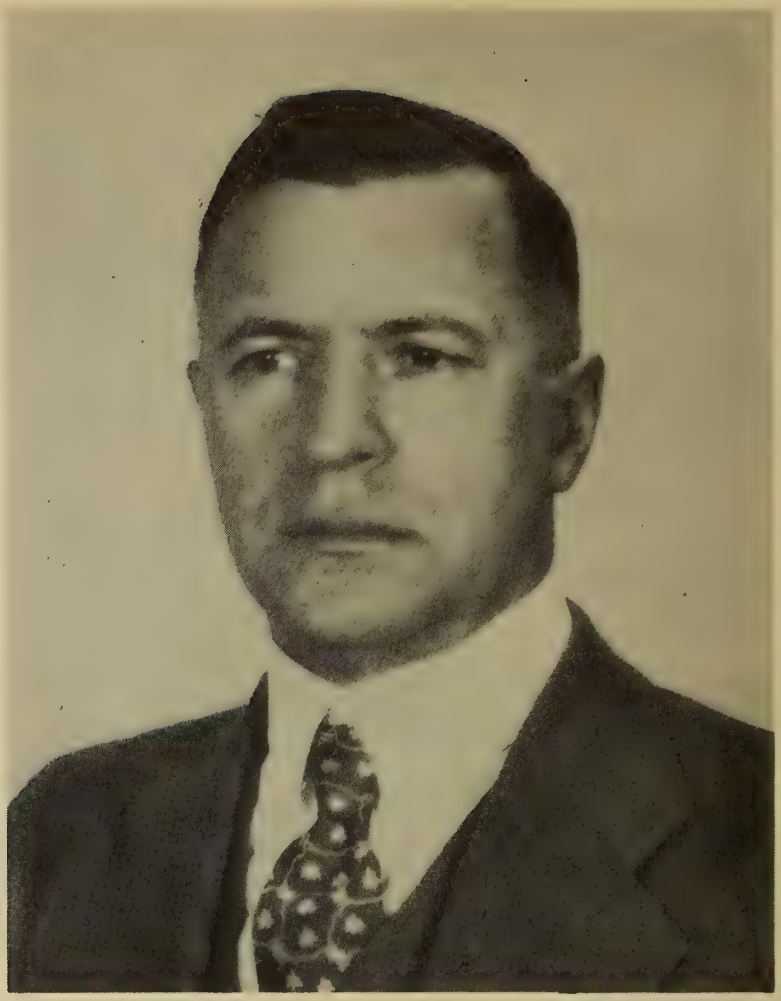
(From USPHS Records)

Staff, Plague Laboratory, San Francisco, California, 1902.

SEATED (Left to right): Stenographer (name not available); Drs. Mark J. White, Donald H. Currie. STANDING: Diener's Assistant (name not available); Wong Chung, Interpreter; August Venzke. Laboratory Diener.

(From USPHS Records)

Plague Laboratory of Public Health Service, San Francisco, California, 1950.



(From USPHS Records)

Dr. Richard H. Creel

from plague occurred in Lake County, Oregon, and in 1935, infected rodents were found in Oregon and Montana.

STUDIES IN HAWAII

Plague was first reported in the Hawaiian Islands in December 1899. Human and rodent plague has been observed almost every year since that time in some part of the Islands.

Dr. Clifford R. Eskey of the Service during 1932-34 conducted an epidemiological study of plague in the Hawaiian Islands. His studies indicated that a Hawaiian rat, *Rattus hawaiensis,* thought to be extinct, still existed and probably was the chief reservoir of infection. From tissue studies by Doctor Eskey it seems possible that plague may have existed in the central part of the Island of Maui since 1900 and that no attention had been given to occasional dead rats and the few human cases had escaped diagnosis.

IMPROVED METHODS DEVISED

In 1936, a method was devised which greatly simplified the field activities which had begun to spread over long distances in the West. Dr. Clifford R. Eskey, then in charge of the Plague Suppressive Measures Laboratory in San Francisco, reasoned that if plague were present in communicable form in a rodent, it should also be present in the blood-sucking ectoparasites which lived on that rodent. If these ectoparasites were inoculated into guinea pigs, then plague should be demonstrated as easily as if tissue from the infected rodent were inoculated instead. On May 11, 1936, after about a month of negative results, the hypothesis proved to be practical. One hundred and forty-six fleas removed from 50 ground squirrels (*Citellus richardsonii nevadensis*) shot in Elko County, Nevada, were ground up and inoculated into guinea pigs, which subsequently died. Pathology was typical for *Pasteurella pestis* and was confirmed by cultural reactions.

This method of plague diagnosis has proved most useful in field operations at a long distance from the laboratory. Its inauguration in 1936 came at a time when plague had recently been found outside of California and facilitated the field operations which were soon to be extended to 17 of the westernmost States. Inoculation with tissue is still

done on occasion, but a recent survey of past results indicates that positive specimens would have been missed in many instances if tissue inoculation only had been done, while very few positives have gone unconfirmed when ectoparasite inoculation only is done. The application of this method has proven to be a valuable contribution to the study of the epidemiology of plague.

PLAGUE INFECTED WILD RODENTS

The relationship between infected wild animals and human plague is an old story. The role of the tarabagan or marmot (*Arctomys bobac*), a large fur-bearing rodent, was known to Asiatic trappers years before the etiologic agent was discovered in Hong Kong in 1894. The tarabagan was proven to harbor *Pasteurella pestis* in 1895. Prior to 1908, other animals were proven to be natural reservoir hosts as follows:

Year	*Rodent*	*Locality*
1898	*Sciurus palmarum* (squirrel)	India
	Hydrochoerus capybara (porcupine)	
1902	*Cavia cobaya* (guinea pig)	Australia
1907	*Rhabdomys pumilio* (striped mouse)	South Africa
	Gunomys bengalensis (mole rat)	India
1908	*Citellus beecheyi* (California ground squirrel)	California

Thus it can be seen that the wild rodent focus in California (suspected but not proven in 1903) was not the first instance demonstrated. While there are known enzootic and epizootic areas in Asia, Africa, and South America, the surveillance over the wild rodent foci in this country has probably exceeded all others in its scope and thoroughness, as well as in the number of years that these surveys have been conducted.

In the search for plague foci, the collection of ectoparasites from domestic and wild rodents has lead to a tremendous amount of entomological study. Beginning with the work of Dr. M. Bruce Mayne and Dr. Carroll Fox and continuing through the present work of Mr. Frank M. Prince, literally millions of fleas, ticks, lice, and mites have been processed. Because the flea is the vector of plague, more work has been done on it than on the other arthropods. Valuable contributions have been made by these entomologists, not only in describing new species but in revising existing classifications.

Plague has been found almost 4,000 times in wild animals of 132 counties of 15 of the 17 westernmost States in this country. Plague in wild rodents ordinarily does not give rise to epidemics and causes only sporadic, isolated, infrequent human cases. However, during the 12 months' period from July 1949 to July 1950, there were five cases of plague in New Mexico and one in Arizona. In addition, the disease has been suspected in 10 cases in California, Nevada, Utah, Montana, New Mexico, and Texas. This is considerably above the previous average which has been about one proved case per year.

The reason for the relatively few cases of human plague in which the infection is acquired from plague-infected wild rodents is the lack of intimate association between man and most of the wild rodents, whereas there is relatively close association between the domestic rat and man. The habits of wild rodents do not bring them into close contact with man except on relatively rare occasions, while the domestic rat, like the *Aedes aegypti* mosquito (vector of yellow fever), practically lives with man.

PLAGUE INFECTION FROM RATS TO GROUND SQUIRRELS

If plague were to remain exclusively confined to rodents in rural areas, then the infection would be of slight concern, but there is a zone adjacent to many communities in the West and Southwest where urban rats come in contact with ground squirrels and other wild life in which plague is prevalent, and therein lies the latent danger.

The infection was transmitted in this manner from San Francisco to the ground squirrels of neighboring counties, and evidence pointed to the epidemic in Los Angeles in 1924 as being due to spread of plague infection from ground squirrels to the city rats.

It is also of some importance to note that the passage of *Pasteurella pestis* through spermophiles (ground squirrels and tarabagan) seemingly endows that organism with a predilection for lung tissue, thus causing a primary plague pneumonia (pneumonic plague). This view is supported by the fact that in the San Francisco epidemic of 1907 and 1908, in Puerto Rico in 1912, and in New Orleans in 1914 where the infection was from city rats, there were a very few pneumonic plague cases, whereas the disease in Manchuria due to tarabagan infection was

predominantly pneumonic. The small series of pneumonic plague cases in Oakland in 1918 and 1919 was due to squirrel infection, and in the Los Angeles epidemic, where there was a number of pneumonic cases, the infection had presumably been introduced through squirrels in the environs.

In view of all this, it is important to maintain a survey of the spread of the infection in wild rodents and to create a zone free of squirrels and other rodents susceptible to plague around communities wherever the infection appears in the vicinity.

TREATMENT OF HUMAN PLAGUE

Until the late 1930's the most frequently used treatment of plague was anti-plague serum. Since 1939 sulfadiazine has proven to be fairly effective. Streptomycin is an effective anti-plague drug. There is some indication that aureomycin, chloromycetin, neomycin, dihydrostreptomycin, and aerosporin have some therapeutic possibilities, but so far adequate trials have not been made. The original work in showing the effectiveness of streptomycin in the treatment of plague was demonstrated on animals by Dr. John W. Hornibrook of the Service. This drug is capable of reducing the case fatality to a very low figure if used early enough in adequate quantities.

Doctor Hornibrook, while engaged in laboratory studies of plague in San Francisco, contracted pneumonic plague and was extremely ill for a number of days. His recovery is attributed to the use of sulfadiazine, although prior to that time he had received vaccination against plague. This may have played some part in his recovery.

Pellagra

Pellagra is oftentimes the poor man's disease. More rarely did it find admission into wealthy homes. To hundreds of thousands of families not quite up to the burdens of daily living, this ailment that caused flaming skin brought added misery. In Europe, where, at the beginning of the present century, it had been known for almost 200 years, it was particularly prevalent in the Mediterranean countries and was thought to be incurable. The more imaginative feared it like the plague, be-

lieving it led inevitably to insanity and death. The victims knew the disease as Mal de la Rosa from the essays of Casal in Spain, the memoirs of Frapolli in Italy, and the dissertations of Strambio. In the comparative prosperity of the United States, pellagra was unknown, or at least unnoted, until 1906. Then it began to be recognized in increasing numbers in many States, especially in the South. The trouble began with a reddening of the skin very much like sunburn, which progressed to scaly eruptions. Next came stomach upsets, diarrhea, and dizziness. In a few cases the mental symptoms amounted to actual dementia. Some cases were fatal.

Dr. Claude H. Lavinder of the Service was one of the first to be alarmed over the spread of this disease. Although the American variety was more severe, he was convinced it was the same disease that was known in Europe. "Like a mushroom, pellagra is coming up overnight, spreading everywhere," Doctor Lavinder wrote. He collaborated with Dr. James Wood Babcock, Superintendent of the South Carolina Hospital for the Insane, Columbia, South Carolina; together they translated Lombroso's monograph on the disease. In 1909 pellagra was the subject of a national conference at Columbia, South Carolina.

By 1911, the Public Health Service estimated that 25,000 cases of pellagra had occurred in the South in the past four years. Through the Hygienic Laboratory, the Public Health Service began an extensive study of the disease. When they began work, Hygienic Laboratory scientists had a wide range of theories from which to choose.

Although scurvy and beriberi were well-known nutritional diseases, investigators thought in terms of the fruitful science of bacteriology. The prevailing weight of scientific opinion was on the side of infection as a cause of pellagra. A British scientist thought it was like malaria and carried by the bite of an insect, transmitting a protozoan parasite. An Italian investigator found many supporters of his theory that it was due to a bacterial fermentation in spoiled corn. (This last theory was particularly unfortunate from a United States trade standpoint, as it cut sales of American corn on European markets.)

A commission of able men (Thompson-McFadden Commission), organized to investigate pellagra in the United States, also concluded it was infectious. Epidemiological studies had proved it to be more

prevalent in the insanitary and unsewered parts of cities. This commission completely missed the point that residents of the unsewered sections could not afford an adequate diet. Taking up the infectious disease theory, Doctors Lavinder, John F. Anderson, and Edward Francis tried to infect monkeys with material from pellagra patients. They were not able to infect monkeys with the disease. A significant observation by Dr. Benjamin S. Warren, a Public Health Service officer observing a case of pellagra in a Federal reform school, was for the moment overlooked. Doctor Warren noted that sanitary conditions were excellent but that the inmates' diets were deficient in animal proteins.

Having made no great progress by the beginning of 1914, the pellagra project was set up on a larger and more systematic scale. Doctor Goldberger was placed at the head of a 41-man team, broken down into separate sections to study the disease from epidemiological, bacteriological, pathological, psychiatric, metabolic, and dietary standpoints. The clear, incisive reasoning of Doctor Goldberger, breaking through existing false theories, produced the right answer.

Doctor Goldberger had already done laboratory research on pellagra when, in 1914, the Mississippi State Health Department called him in to advise on a pellagra outbreak. On his trip south, Doctor Goldberger stopped off in New Orleans and was given a gratuitous lecture on the bacterial nature of pellagra by a local physician. He filed the information away in his mind, but less than 48 hours later, after inspecting an orphanage where a pellagra outbreak had occurred, he began thinking that pellagra could not be infectious. Walking through the dining room of a Mississippi orphanage Doctor Goldberger watched the boys eating their meals. The children were separated into two groups, by age. The older boys did heavy farm work. Their daily rations were larger and included milk and meat. The younger boys were fed a diet chiefly carbohydrate. The younger boys were the only ones who suffered from pellagra.

On his return to Washington, Doctor Goldberger mentally reviewed and assayed all the facts which substantiated his belief. There was the instance of Doctor Edward Francis who had performed the bulk of the work trying to infect laboratory animals with pellagra. "Francis comes down with every infectious disease he works with," Goldberger thought.

(From USPHS Records)

Dr. Joseph Goldberger

"If pellagra were infectious, he would surely have contracted it." In all his own observations, and in all the literature he had studied, in the institutions where pellagra was occurring, it was always the inmates, never the doctors or nurses, who developed the disease. Infectious diseases do not behave this way. Clearly, the one factor which might affect the inmates, and not the supervisory staff, was the diet which in all cases was markedly different between the two groups.

On June 26, 1914, Joseph Goldberger announced his views of pellagra as a dietary deficiency, and thereby emphasized the importance of the nutritional deficiency diseases. In his original announcement, Doctor Goldberger went no further than to observe that the deficiency apparently was in such protein foods as eggs, meat, and milk. As to treatment, Doctor Goldberger urged: "Pending the final solution of this problem, it may be well to attempt to prevent the disease by improving the dietary of those among whom it seems most prevalent. I would urge the reduction in cereals, vegetables, and canned foods, and an increase in the fresh animal food component such as fresh meats, eggs, and milk."

Joseph Goldberger set out at once to prove his position. He chose the most dramatic possible demonstration. All youngsters in the two Mississippi orphanages where Doctor Goldberger had observed firsthand the relation between diet and pellagra were given extra rations of milk, meat, and eggs. And by the beginning of 1915, a year in which the State of Mississippi recorded 1,535 pellagra deaths, not a single child in the orphanage had pellagra.

This was the merest beginning of scientific documentation of Goldberger's theory. It was to go through successive studies in the laboratory and in the field for 20 years. After Joseph Goldberger's untimely death in 1929, these studies were pushed forward by his friends and associates. Doctor Goldberger had shown he could cure pellagra by substituting a good for a poor diet. The next obvious scientific step was to produce the disease by putting subjects on what the doctor had decided was a pellagra-producing diet.

Joseph Goldberger knew his results would be more clinching if he could use human subjects, not laboratory animals. So he asked a favor of Governor Earl L. Brewer of Mississippi: Would he be allowed to ask

for volunteers from the Rankin Prison Farm, an institution which had never known pellagra? The experiment would be simple, involving no injections of death-dealing germs. It would consist solely of feeding the men a diet all too familiar to many poor people of the South: Mush, molasses, grits, cabbage, potatoes, and rice. The Governor agreed.

In early February of 1915, with Dr. George A. Wheeler as his co-worker, Doctor Goldberger set up his experiment at the Rankin Prison Farm. Eleven male convicts (with no previous pellagra history) decided to risk sickness, and perhaps death, for a pardon. The 11 volunteers were segregated from the rest of the camp. For two months no change was made in their normal diet, and none of the men showed signs of pellagra. Then, on April 19, the switch was made to the grits-rice-potato regimen. Within five months, six out of the 11 convicts developed the red rash of pellagra.

When the pellagra diagnosis had been double-checked by outside experts, Doctor Goldberger wrote a letter to the Governor of Mississippi. ". . . Science and humanity will for all time owe you a profound debt of gratitude . . ." And for the scientific records, he noted: ". . . The conclusion is drawn that pellagra has been caused in at least six of the 11 volunteers as the result of the restricted diet on which they subsisted."

It is a tribute to the scientific thoroughness of the Hygienic Laboratory of the Public Health Service that it continued, even after Doctor Goldberger's dietary theory was essentially proven true, to investigate the possibility that pellagra might be infectious. Dr. Edward Francis continued until 1917, unsuccessfully, to cause infection by injection of human pellagrous tissues into laboratory animals, including 123 monkeys at Savannah, Georgia.

To prove to the diehards who clung to the infectious theory, Goldberger tried something both dangerous and dramatic. It was true that Francis had been working on monkeys, but perhaps monkeys were naturally immune to pellagra. What would happen if the same thing were tried on human subjects? On April 25, 1916, at the Spartanburg Hospital, Doctor Goldberger drew blood from the arm of a woman suffering from her first attack of pellagra. He injected some into the arm of Doctor Wheeler, and Wheeler returned the favor by injecting Goldberger. For two days, both had sore arms, but no red rash appeared.

Doctor Goldberger, who had almost died of typhus fever and yellow fever in his work in Mexico, did not get pellagra.

Later, Doctor Goldberger went even further and conducted an even more dramatic test. He made pills out of intestinal and other discharges and skin rash scales of pellagra patients and swallowed them. He fed the same dose to four other Laboratory scientists. But the clincher came when he injected the blood of a pellagrous woman into his own wife, Mary Goldberger. This was all the evidence most people needed to be sure pellagra was not infectious.

It was not enough for the Hygienic Laboratory to know that diet was the controlling factor in pellagra. It needed facts—hundreds of them—on which the Public Health Service could build a control program to wipe out the disease. The laboratory wanted to know: Does age and sex have anything to do with contracting the disease? Does it run in families? What about seasonal incidence? Do living conditions, particularly sanitation, make a difference? What is the relation to family incomes? To get the answers, the Laboratory set up a field survey in 1916 of 24 South Carolina cotton mill towns. They were typical in population and dietary habits. The men worked in the textile mills. The household diet was the well-known Three M's—white hog meat, meal, and molasses. For five and one-half years every family in the 24 towns was under close scrutiny. Doctor Goldberger, with his faithful aide, Dr. George A. Wheeler, headed the investigation. Edgar Sydenstricker and Wilford I. King, statisticians, made scientific order out of the accumulated facts.

Fanning out from headquarters of the United States Public Health Service Pellagra Hospital at Spartanburg, South Carolina, directed by Dr. Randolph M. Grimm, the field corps composed of Dr. R. Eugene Dyer, Dr. J. Davis Reichard, Dr. William S. Bean, Jr., Dr. Paul M. Stewart, Dr. Meade C. Edmunds, and Ralph E. Tarbett, a sanitary engineer, covered the 24 towns. Some of the pellagra cases found in the villages were brought to the hospital for treatment. These doctors were scientists turned house-to-house salesmen. Getting their feet in the door was not the least of their problems, but once in, the job was still ticklish. Tact and patience were required to find out exactly what items were on the weekly market list, and to permit on-the-spot examinations for signs of the red-skinned trouble. Equipped with candy

and chewing gum, the doctors first made allies of the children, and proceeded from them to their mothers.

The survey turned up a stock of important pellagra facts:

Pellagra is predominantly a disease of children two to 15. It is rare in children under two and in males 15 to 40. It is more frequent in young and middle-aged women than in men.

The death rate was less than other observers had believed—between 1.5 and 3 percent. Incidence ran 50 per 1,000 population.

The pellagra "season" was from March to October, with the majority of cases from April to August. This corresponded with the variation in food supplies. Consumption of fresh meat, milk, and butter declined in the early months of the year, setting the stage for pellagra. After a summer of fresh fruits and vegetables and more milk in the diet, the pellagra symptoms disappeared.

Insanitary conditions had nothing to do with pellagra, but economics did. Pellagra rates went up in hard times, when there was little or no money for even the cheapest foods.

Doctor Goldberger knew that pellagra was caused by the deficient diet, that it could be cured by meals providing sufficient amounts of milk, fresh meat, butter, and eggs. But few of the South's very poor families—the chief sufferers—could afford food of that kind and diversity, nor could institutions for the indigent, the orphaned, or the mentally ill afford it, with their limited budgets.

What could Doctor Goldberger do about that? On the first day of January 1918, at the Hygienic Laboratory in Washington, he began a food hunt which was continued by his fellow scientists through the middle thirties. Goldberger knew that pellagra prevention was not a simple matter of eating one class of foods, say proteins. There was an unknown, single dietary factor that was the pellagra-preventive, and he hoped to find that factor and to sort out the inexpensive foods in which it could be found.

Doctor Goldberger and his associates were the first to produce convincing evidence that blacktongue in dogs was the canine equivalent of pellagra, and to use it as a laboratory tool to search for the pellagra-preventing substance. This laboratory method (that is, canine blacktongue) is still being used today in nutrition research.

Furthermore, it was the availability of this laboratory method which permitted the isolation and the identification of nicotinic acid as the P-P (pellagra-preventing) vitamin by Elvehjem and associates in 1937.

Doctor Goldberger's studies led him to believe that a physiologically defective protein supply, that is, an amino acid deficiency, was a very important factor in the etiology of pellagra, in addition to the possibility that a "vitamin" deficiency of cystine or tryptophan might be responsible. As a matter of fact he tried treating pellagrins with these amino acids with successful results (Public Health Reports, March 3, 1922). The results with tryptophan are shown by a letter to Doctor Goldberger from Dr. William F. Tanner, one of Goldberger's associates for several years.

Milledgeville, Ga.
August 5, 1921

Dear Doctor Goldberger:

In regard to patient Oconee Cobb I have the following to report:

The use of tryptophan was begun at the evening meal August 1 and has been continued since. One-half dram has been given just before each meal, without interfering in any way with any other supplement or medication. This patient's bowels had been moving about four times daily but on the third of August there were seven loose stools, whereas yesterday there were three loose stools. The condition of the bowels seems about the same today as yesterday. On the third some slight improvement was noticed in the skin condition. Yesterday this improvement was more marked and today the skin shows a condition which is nearly normal, except for an appearance of tenderness and loss of elasticity. The erythema has almost entirely disappeared from the backs of the hands. The lesions on the feet are no longer acutely erythematous but appear of very nearly normal color and the especially erythematous patches present the appearance sometimes seen when blebs have healed without bursting. I might add that the improvement in this patient's skin condition has surpassed anything I have ever seen in a case of pellagra in an equal period of time. It might be well for you to see her as early as you find it convenient.

On account of the increased period covered to date by the patient's taking the milk salt solution the collection of additional data is necessary and this will require several days more before I can mail you a report on this experiment. However, I will get this out as quickly as I can.

Sincerely,

/s/ W. F. Tanner
Passed Assistant Surgeon

It was not until 1945 that it was discovered (by Krehl and Elvehjem at Wisconsin) in rat experiments that there was an unusual metabolic relationship between tryptophan and nicotinic acid. It has now been

clearly proven that both man and animals can convert the amino acid tryptophan to nicotinic acid. It is evident that pellagra represents a deficiency of both tryptophan and nicotinic acid. Thus Doctor Goldberger's hypotheses were right on two counts.

The condition of the Georgia State Sanitarium in Milledgeville provided Doctor Goldberger with a made-to-order experimental laboratory. The mentally ill negro women patients who ate the doctor's low-cost diets never knew what they contributed to the eventual conquest of pellagra. Goldberger fed them dried soybeans, cowpeas, and dried skim milk. Some came down with pellagra, some did not.

An accident gave him his first real clue to an inexpensive source of the pellagra-preventive factor. In experiments on blacktongue in dogs Doctor Goldberger added brewer's yeast to the animals' diets to build them up for their eventual bout with pellagra. But these dogs never developed pellagra when they should have. The brewer's yeast had prevented it. By the end of 1924, after an ounce and a half of yeast had been added to their daily fare, not a single patient at the Milledgeville institution had pellagra.

The hunt for inexpensive sources of the pellagra-preventing factor was continued after Doctor Goldberger's death in January 1929. In 1934 Doctor Wheeler and Dr. Donald J. Hunt, still carrying on at Milledgeville, found excellent reservoirs in pork muscle and peanut meal. That same year Dr. William Henry Sebrell prepared a list of foods, rated good, fair, slight, and none, in relation to their pellagra-preventive properties. This list was of inestimable value to institutions trying to stamp out pellagra and yet remain within their food budgets.

The search for more knowledge about pellagra still continues. The pellagra-preventing factor first was narrowed down to Vitamin B, then to nicotinic acid. Today, 1950, at the National Institutes of Health, a study is being made of the inter-relationships of all dietary substances which affect the likelihood of a person's developing pellagra. This is just one part of a comprehensive study of nutrition as it relates to disease —all of it started by the simple but clear-sighted deduction of one man, Goldberger, in 1914.

Many brilliant and capable men have performed the bulk of their scientific investigations at the Hygienic Laboratory and among them

was Joseph Goldberger. He was a product of the period and his life was an Horatio Alger experience common to other great Americans. He was born on a peasant tenant farm in Czechoslovakia in 1874 and brought to New York City when he was seven. For the early part of his life he delivered groceries for his father on the lower East Side. At 16, he decided on a course in civil engineering, but two years later switched to medicine after he heard the Harvey Lecture given by a Bellevue Hospital College physician. In 1895 he graduated second in his class at Bellevue, where he had acquired a reputation as a hater of routine but a master of case history writing. To him, every case was a great and absorbing mystery, the solution an exciting challenge.

After a two-year try he decided that private practice was not his field and in 1899 he entered the Marine Hospital Service. He performed brilliant and dangerous work on typhus fever, operating always at the epidemic scene. He also made important studies of the Mexican form of typhus fever and of yellow fever. But the great chance to exercise his talents, his greatest contribution to humanity, came when he was put in charge of the pellagra investigations.

Joseph Goldberger inspired deep affection as well as respect in his associates and friends. No greater tribute could be paid to his personality. A fellow worker at the Hygienic Laboratory, Dr. Arthur M. Stimson, wrote of Goldberger and his work: "We cannot dismiss the subject [of pellagra] without some reverent gesture to the man of all men who was chiefly responsible for the solution of this mystery of centuries, this health problem which was the despair of the authorities. . . . He illuminated everything he touched and won the admiration and affection of his associates."

Industrial Hygiene

That a man's working environment may adversely affect his health and hasten his death was recognized by the Public Health Service as a major area of study as early as 1910, when conferences were held by Surgeon General Wyman with Joseph E. Holmes, Director of the Bureau of Mines. Shortly after this, Dr. Samuel C. Hotchkiss was assigned to Joplin, Missouri, for studies of silicosis among miners working in that

area. Later, similar studies were carried on in the vicinity of Pueblo, Colorado. The work in the Joplin Tri-State District begun by Doctor Hotchkiss was resumed in 1914 by Dr. Anthony J. Lanza and continued for three or four years.

In 1913, Dr. James A. Watkins began studies of the steel industry at Homestead and Duquesne, Pennsylvania. These investigations were conducted over a rather extended period of time and included sanitation of the plants as well as working conditions and health of the employees. Following these studies, the United States Steel Corporation appointed Dr. Thomas Darlington, then commissioner of health of New York City, as the head of the medical and sanitary department of that company. Doctor Darlington continued in that capacity for many years.

In 1914, studies among garment workers in New York City and the steel industry at Youngstown, Ohio, were undertaken under the direction of Dr. Joseph W. Schereschewsky. He was placed in charge of all industrial hygiene work of the Service. Doctor Schereschewsky's headquarters were established at Pittsburgh, Pennsylvania, where he remained until 1918.

The investigations in the garment-making industry brought to light the existing insanitary conditions and the excessive rate of tuberculosis among the workers, paving the way to the abolishment of the "sweat shop." Also, partly as a result of the findings and recommendations of the study, the now well-known International Ladies' Garment Workers' Union Health Center was established and has seen a steady expansion through the years. Investigations of tuberculosis in industry were begun by Dr. Dana E. Robinson at Cincinnati, Ohio, in 1914.

With the inauguration of these investigations by the Service, a program of intensive research was begun that was to set the pattern for such studies the country over. A succession of surveys of the health hazards in the major industries helped to relieve thousands of workers from conditions inimical to their health and provide for them safer work environments.

PLANNED STUDIES UNDERTAKEN

Beginning in World War I, the Service investigated potential hazards in a variety of industries. Notable among them were studies of lead

poisoning in the pottery industry and of health hazards in brass foundries and in the glass and chemical industries. Special sanitary surveys were conducted in plants manufacturing war materials. Industrial fatigue, illumination, the physiological effects of high temperatures and humidities, and other conditions were studied. A beginning was made in the study of industrial dermatoses, but a full program did not get under way until 1931, when Dr. Louis Schwartz conducted investigations of four candy factories, two silk-dyeing factories, a worsted mill handling dyes, a fur-dyeing plant, and an oil company. In the next year or two, dermatoses studies were placed in a separate Office of Dermatoses Investigations under the direction of Doctor Schwartz. These studies have continued through the years, extending into practically every segment of American industry.

The industrial hygiene program, in the meantime, was growing from a handful of personnel, with a core of only 12 commissioned officers, to a record total of over 200 employees at the height of World War II. When Doctor Schereschewsky was placed in charge of the Division of Scientific Research of the Service in 1918, he was succeeded briefly in industrial hygiene by Dr. Anthony J. Lanza, followed temporarily by Mr. Bernard J. Newman, and later by Dr. William J. McConnell, who served a short time in this capacity until relieved by Dr. Lewis R. Thompson, who assumed charge of the work on April 6, 1921.

During Doctor Thompson's long tenure of office, he initiated a series of intensive dust studies in a half-dozen different industries in which there were wide variations in type and kind of dust exposure. Such studies, Doctor Thompson felt, were important because the number of workmen employed in dusty trades comprised one of the largest groups exposed to any one industrial hazard. These studies were inaugurated in 1923 and were helped immeasurably by the development of a new dust sampling instrument for the assaying of dust exposures. Known as the impinger, this instrument, which is still used as standard sampling equipment in dust studies, was developed jointly by the Public Health Service and the U. S. Bureau of Mines. Dr. Leonard Greenburg and Mr. George W. Smith did the original work in developing the impinger, while its practical application in the field was tested and proved by John J. Bloomfield, a sanitary engineer. These classic studies were con-

ducted over a period of years in the so-called dusty trades—the granite, cement, and cotton textile industries, the mining industries, and others. Dr. Waldemar C. Dreessen and Dr. Robert H. Flinn were identified with some of the dust investigations conducted in the 1930's and early 1940's.

This pioneering work may be exemplified by the study of the granite cutting industry in Vermont. Exposed to high levels of free silica in the form of quartz, one segment of this industry, the monument workers, were, in effect, carving their own epitaphs. The study revealed the presence of an unmistakable health hazard, the chief result of which was a rapidly fatal form of pulmonary tuberculosis, with an annual death rate of 18 per 1,000 workers. With the introduction of the control measures recommended by the Public Health Service, and carried out by Dr. Albert E. Russell and John J. Bloomfield, this industry has been freed of a severe silicosis threat.

Under the direction of Doctor Thompson, the collection of data for investigations of industrial morbidity began in the 1920's and has continued. The early fundamental work in assembling basic statistical data was under the direction of Dean K. Brundage. Information has been supplied periodically by industrial sick benefit organizations, and further sources have been the records of medical departments of several large industrial establishments and the records collected by the Public Health Service in connection with specific studies.

Also noteworthy during this period was the completion in 1925 of a statistical study of the physical condition of 10,000 industrial workers, embracing physiological measurements, defects, and diseases. Although no outstanding facts with reference to industrial hazards were disclosed by the analysis, a clearer understanding of the place of the physical examination in industrial hygiene was obtained, and numerous interesting relationships of a physiological and anthropological nature were established or confirmed. These findings have since been used as a norm of subsequent investigations. The pioneering work in this field was conducted by Rollo H. Britten.

Studies of radiation were begun as early as 1923, when physical examinations were made of employees handling radium in the United States Bureau of Standards. Later, investigations were made in the

radium dial painting industry, where workers used their lips to point the tips of the brushes, with numerous resultant fatalities. With the increasing use of radiation in various forms, an atomic radiation hazards unit was created subsequently in 1947.

Another of the many problems studied during that period concerned the possible effect on health of automobile exhaust gas in streets and repair shops of large cities. This study showed that the percentage of carbon monoxide concentration in the air of city streets was not high enough to be a health menace. This study, as well as a study of the effects of chromic acid exposure, was led by John J. Bloomfield, who later became Assistant Chief of the Division of Industrial Hygiene. The chrome study, reported in 1923, set the first national standard for electroplating work. During later studies in the steel industry, Mr. Bloomfield introduced the occupational analysis technique whereby every job was broken down into the number of hazards involved and the duration of each exposure, and the information was then related to the clinical picture. This technique of job analysis has formed the pattern for all of the many later field studies in industrial epidemiology.

Another major activity during this period, initiated at the request of the Governor of Pennsylvania, was a study of the nature and prevalence of chronic incapacitating miners' asthma (anthraco-silicosis). Almost one-fourth of the hard coal miners examined in the survey were found to be suffering from this form of pneumoconiosis. The findings of the study, conducted by the Public Health Service in cooperation with the State departments of labor and industry, and of health; the anthracite coal operators; and the United Mine Workers of America, brought forth detailed medical and engineering recommendations for control measures.

When Doctor Thompson was transferred to other duties in 1930 after a busy 10 years, his successor was Dr. James P. Leake, who served until December 1932, when Dr. Royd R. Sayers assumed charge. Notable among the many diverse studies to follow was that of mercury absorption and poisoning among the fur cutters in the hatting industry. Chronic mercurial poisoning was so common that many employees were affected with a fine intention tremor, which is a cardinal symptom of the disease. Recommendations were made and put into effect to prevent

further poisoning. Later (1941), at a conference called by Surgeon General Thomas Parran, attended by representatives of the industry, labor, State health departments, and State labor departments, a nontoxic carrotting substitute which had been developed by the industry was adopted.

At the request of the chairman of the House Appropriations Committee, a study of the health hazard to workers employing lead arsenate in the apple orchards of Wenatchee, Washington, was conducted by the Public Health Service in 1940. As a result of the Service's investigations into this problem, methods were developed to protect not only the sprayers but also the consumers of apples.

COOPERATION WITH STATES

The consultative work of the Public Health Service in the field of industrial hygiene with other Federal agencies and State health departments was steadily growing after 1920. In 1936, the States' relations phase of the work assumed a new importance following the passage of the Social Security Act, which provided funds for the development of industrial hygiene programs in the States. Because of his wide background in industrial hygiene, Mr. Bloomfield was assigned the task of organizing industrial hygiene units in State and local health departments.

In 1937, the industrial hygiene and sanitation work, together with the dermatoses investigations, became the Division of Industrial Hygiene of the National Institute of Health. Work with the States, however, continued to occupy an increasing proportion of the efforts in this field.

Because of this tremendous increase in States' relations work, the Division of Industrial Hygiene, in 1944, was transferred from the National Institute of Health to the Bureau of State Services. In testimony to the importance of industrial hygiene in public health activities, today there is an official industrial hygiene unit in the health department of practically every State, and in Hawaii and Puerto Rico.

A study of the working environment and the health of workers in bituminous coal mines, non-ferrous metal mines, and non-ferrous metal smelters in Utah, conducted by the Service, is especially significant in that it laid the groundwork for a State occupational disease disability law and the establishment of an industrial hygiene unit in Utah. Under-

taken at the request of the Industrial Commission of Utah, the study was conducted in cooperation with various State agencies, including the Industrial Commission, the State Board of Health, industrial organizations, and labor groups.

When Dr. Royd R. Sayers became Director of the Bureau of Mines in 1940, Dr. Paul A. Neal was placed in charge and helped to further the research activities of the Division until he was succeeded in 1941 by Dr. James G. Townsend. Under Doctor Townsend's leadership, toxicological research has been accelerated, extending into the newer virulent economic poisons, such as parathion and the other organic phosphates, as well as toxic industrial chemicals. Laboratory studies have been further expanded through the establishment of a field station at the University of Utah at Salt Lake City and the acquisition of larger quarters in Cincinnati, Ohio, for the main laboratory.

Cooperative relationships with other Federal agencies, as well as management and labor groups, have been increasingly developed. During World War II, for instance, in cooperation with the U. S. Navy and the U. S. Maritime Commission, the Service undertook a study of health hazards of arc welders in steel ship construction.

In addition to investigation of in-plant hazards, the Service recently conducted one of the most comprehensive studies of air pollution undertaken to date. The investigation of the Donora, Pennsylvania, smog in 1948, during which almost 6,000 persons became ill and 20 died, illustrates the type of teamwork that has been developed over the years. The 25-man field team included physicians, engineers, chemists, nurses, dentists, statisticians, and others. In addition meteorologists from the U. S. Weather Bureau played a key role. During the study, members of the team visited a third of all the houses in the area, interviewed 1,500 families, studied hundreds of medical records and individual histories, and collected and tested more than 4,000 samples of air in and around Donora for all types of chemical substances that might be present. The results of the study, pointing out that air pollution can cause serious acute disabling illness, opened the door to a whole new field in public health—the chronic as well as acute effects of air contaminants on health.

The development of a unique type of epidemiological approach to occupational disease was one of the most outstanding contributions of

the Public Health Service to the field of industrial hygiene. This technique of relating the occupational exposure to clinical findings was first developed on a mass scale in the dust studies of the Public Health Service.

Another major contribution may be said to be the conduct of studies in the field under actual conditions of exposure and disease. Whereas many investigators have contented themselves for years with animal experimentation, the Service has observed human subjects—workers exposed to potential hazards in their working environment. Supplemental animal experimentation was not used until 1935, but to this day industry itself remains the most fruitful test laboratory in the fight against occupational disease.

The greatest contribution is that implied in the objective to which the Service is dedicated—the protection and maintenance of the health of the worker. This has been and is being accomplished through countless continuing medical and environmental studies to control hazards wherever they may be found so that man may work without danger to his health and to his life.

Trachoma Control

EARLY TRACHOMA SURVEYS

At a meeting of the American Academy of Ophthalmology in 1911, Dr. J. A. Stucky of Lexington, Kentucky, read what was considered to be an alarming and exaggerated report concerning the prevalence and nature of trachoma in eastern Kentucky.

Following this report and partly stimulated by it, the Committee on the Prevention of Blindness of the American Medical Association called attention to the problem of trachoma at the annual meeting of the Association held in Atlantic City during June 1912. Action taken at this meeting resulted in the following specific proposal:

> That the necessity of a study of trachoma in the United States is imperative, and that the Public Health and Marine Hospital Service be requested to undertake a study of this disease, its prevalence, mode of spread and measures of prevention.

The Minnesota State Board of Health in April of 1912 had requested the Service to make a survey of trachoma prevalence. During the next two or three years, various medical officers of the Service studied tra-

choma prevalence in several States; Dr. Taliaferro Clark in Minnesota, Dr. John McMullen in Kentucky and elsewhere, Dr. Walter W. King in Puerto Rico, Dr. Merwin W. Glover in California, Dr. Joseph W. Schereschewsky in Tennessee, Dr. Albert D. Foster and Dr. C. A. Bailey in North and South Carolina, Virginia and West Virginia.

A considerable number of officers of the Public Health Service had gained familiarity with clinical trachoma at various immigration stations where they were assigned for the medical inspection of arriving aliens. Experience in the treatment of the disease was acquired by these officers during the period of detention of such trachoma cases by the immigration authorities.

Dr. John McMullen arrived in Kentucky to conduct the survey of trachoma about July 1, 1912. He found it to be a definite problem in eastern Kentucky. His final report on the intensive survey showed that among the 18,000 people examined by him between seven and eight percent had trachoma. Some areas had a much higher rate. The plan of control recommended by Doctor McMullen had two principal aims, namely, treatment of existing cases and the prevention of new ones. The second aim, that of health education, would be carried on simultaneously with the case-finding and treatment phases of the program by informing the people regarding the prevalence and mode of spread of the disease, and encouraging improvements in personal hygiene.

TRACHOMA CONTROL WORK BEGINS

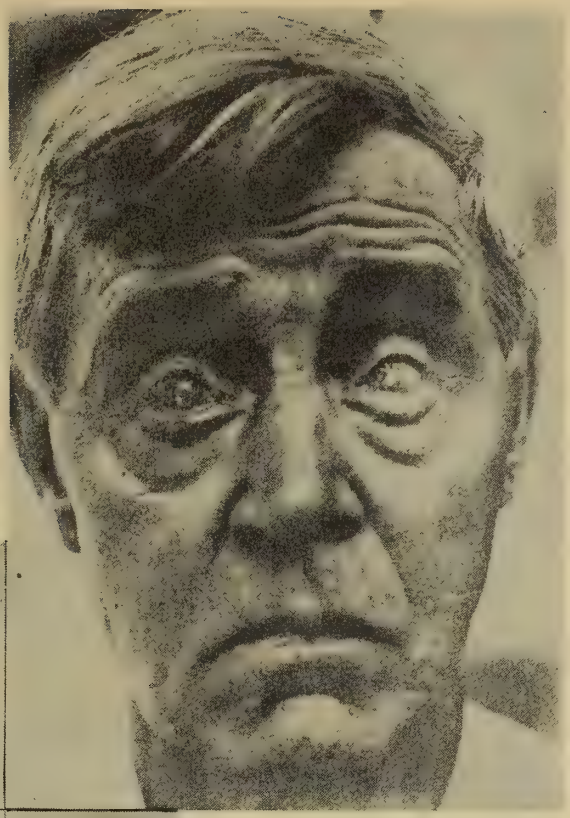
Early in 1913, Dr. Joseph N. McCormack, State Health Officer of Kentucky, asked the Public Health Service to undertake the control of trachoma in that State. To comply with this request, if Doctor McMullen's plan was to be followed, meant that the Public Health Service in cooperation with the State Board of Health must go into the State and assume the responsibility of providing direct medical and hospital care for persons who were not legal beneficiaries of the Service. In order to insure that funds could legally be used for this purpose, Congress authorized the use of money from the annual "epidemic" fund for the prevention and control of trachoma. President Woodrow Wilson, on June 23, 1913, approved the appropriation Act which first made these funds available for the purpose.

Doctor McMullen soon thereafter was ordered to undertake the control of trachoma in the Appalachian area based on the plan that he proposed. He established his central office at Lexington, Kentucky, and later transferred it to Louisville, Kentucky. He lost no time in getting his work under way and opened the first field hospital at Hindman in Knott County, Kentucky, on September 4, 1913, with two nurses and one physician trained in ophthalmology. The cots and other essential materials for this hospital were hauled over mountain trails for 45 miles.

In this pioneer work, any treatment of these isolated mountain people had to be carried right to their mountain homes. It was decided, therefore, to establish small temporary hospitals in various sections. During the next 11 years hospitals were operated at Hindman, Kentucky; Hyden, Kentucky; Coeburn, Virginia; Jackson, Kentucky; London, Kentucky; Pikeville, Kentucky; Welch, West Virginia; Tazewell, Tennessee; Knoxville, Tennessee; LaMoure, North Dakota; Richmond, Kentucky; Russelville, Arkansas; Pelham, Georgia; and Rolla, Missouri. The capacity of these hospitals ranged from 20 to 35 beds. The professional staff of each hospital consisted of one physician trained in diseases of the eye, and from two to four nurses.

Miss Will S. Brashear was the first nurse to go on duty at a trachoma hospital. This was at Hindman, Kentucky, on August 14, 1913. About the same time, Miss Mae Hicks was appointed Chief Nurse for the trachoma control program.

A very essential part of this work was to gain the confidence of the people among whom the project was to be conducted. If Doctor McMullen had failed in this, the patients who needed his treatment and whose living habits with regard to the spread of trachoma he wished to change would not have visited his field clinics and field hospitals. Doctor McMullen was admirably fitted by temperament and experience for this assignment. His medical degree was obtained from the University of Maryland in 1895. He entered the Service in 1897. Reared in Georgia, he was familiar with the population of the Appalachian area from which most of his patients would be drawn. In 1913, and even to this day, the population of the Appalachian area are the direct descendants of the early English, Scotch, and Welsh settlers. Elizabethan English may still be heard in that section of this country. Ex-



(From USPHS Records)

Blind patient showing effects of a long-standing case of trachoma.

(From USPHS Records)

Dr. John McMullen and patient, about 1914. One of the distressing symptoms of trachoma is that the patient cannot bear the light.

(From USPHS Records)

Trachoma Hospital, Jackson, Kentucky, 1916.

(From USPHS Records)

Drs. James A. Stucky, Russell W. Rayner, and John McMullen en route to a trachoma clinic in the Kentucky mountains, 1914.

tensive experience in the surgical treatment of trachoma among arriving aliens at Ellis Island, New York, had given Doctor McMullen an adequate professional competence. A warm, understanding personality was the other personal qualification that assured success in his work.

Doctor McMullen was singularly successful in carrying forward the program of eradication of trachoma. After a few months in the Kentucky mountain country, the news of his advent into a town was always quickly carried up and down the various creeks and hollows, with the result that an informal clinic would soon be in full swing in a church yard, in a country store, or in a courthouse. The word that went out was "Big Doc is in town." Many touching human interest stories could be recounted about the doctor and his grateful patients. Passing a mountain cabin one day, Doctor McMullen was asked to see the woman of the house. She was sitting in a darkened room (one of the principal symptoms of trachoma is an inability of the patient to remain in the light). Upon entering the room, Doctor McMullen could not see her clearly. In order to get acquainted and break down the ever-present reserve typical of the mountain people, he remarked, "That is a mighty pretty baby you are holding." Promptly she replied, "My baby is two years old, but I have never seen it." Later Doctor McMullen operated on her and was present to observe the pleasure and happiness of the mother when she saw her two-year-old child for the first time.

FIELD NURSES AND FIELD CLINICS

One or two nurses worked out of each hospital as field public health nurses. The first of these field nurses was Miss Edna B. Hill. Their achievements have been emphasized frequently by those who took part in this program. During the first 14 years that this work was carried on in Kentucky, a compact group of 27 counties in a mountainous terrain of 18,000 square miles was covered by horseback, mule-back and on foot. The common trail in those days was the bed of a shallow stream. The nurse's duty was to visit each individual home, examine all members of the family, get acquainted with them, win their confidence, revisit them if necessary, and get those who showed symptoms suspicious of trachoma to visit the nearest field hospital or attend a nearby field clinic. The field clinics were held usually at weekly intervals at a designated

point for a period of a month or more. The field clinics were held in churches, homes, courthouses, and by the road side. These were conducted by a physician especially trained in diseases of the eye who was in charge of the nearest field hospital. These field clinics were for two purposes: To make diagnoses of cases of trachoma, and to provide treatment for those needing it. Usually, the nurses first saw the cases that were suspected of being trachomatous. The final diagnosis was made by the physician in the field clinic. Many treatments were also given in the field clinics.

The field nurses and the physicians at the field clinics were imbued with the need for preventive measures within the homes and in public places. In their day-by-day work, these nurses and physicians laid continuing stress upon elemental personal hygiene. The simple instructions were well received and the results gratifying. The physician in charge of the field hospitals, therefore, had three principal duties: First, to treat cases in the hospital; second, to give general direction to the work of the field nurses; and third, to conduct field clinics in the territory surrounding his hospital.

The more severe cases of trachoma were hospitalized at the field hospitals, while the milder cases were treated in the field clinics. At many of the field clinics surgical procedures were undertaken. By this means the usefulness of the field clinics was greatly enhanced. A group of patients suffering from trachoma who needed special care or some operative procedure would be assembled by the field nurse in a church or other public building. Portable cots were set up for the patients, and local women's clubs provided and served food to them. An operating room was improvised and the patients were taken care of as each individual case required. Each operative clinic was planned so that the patients might be kept under semi-hospital care for at least one week. These operative clinics were held only during the warmer seasons of the year. Local physicians assisted by giving anesthetics.

Although the surgical procedure varied with the severity and extent of the injury to the eyeball and lids, generally speaking the operation consisted of removing from the surface of the upper and lower lids the inflamed growth that had developed and was injuring the eye. In some cases plastic surgery on the affected eyelids was necessary.

The program developed by Doctor McMullen and his co-workers may be described as follows:

(1) Finding the individual patients suffering from trachoma. This was not easy because of the primitive means of travel and the isolated homes of many of these patients.

(2) Getting the infected individuals under treatment. Often the families were suspicious of the motive of both nurse and physician, and several visits were sometimes necessary before the patients would accept treatment or permit their children to receive treatment.

(3) Giving simple instructions in matters pertaining to eye and personal hygiene especially when one or more members of a family had trachoma.

EXCELLENT COMMUNITY COOPERATION

Doctor McMullen was very effective in winning the cooperation of State health officials, practicing physicians, school teachers, county officials, and individual citizens. During the period of 11 years, a score or more of nurses and physicians were employed in the work. About 1922, Miss Ida Bengtson, a competent bacteriologist, was detailed from the Hygienic Laboratory to the Rolla trachoma hospital and spent several years there in an effort to determine the cause of trachoma. Doctor McMullen did not write extensively regarding his work. In the Public Health Reports published in 1923 under the title, "Results of a Three-Year Trachoma Campaign Begun in Knott County, Kentucky, in 1913," he said:

> In order to determine the results of the campaign for the eradication and prevention of the further spread of trachoma in Knott County, the writer returned there in July and August, 1923 . . . Taking into consideration those cases that I saw personally, and going over the list carefully with county health officer, out of the 740 there were only 12 cases that were known to be suffering at the time from active trachoma. Four hundred and sixty-nine, or 63 percent, were known to be completely cured of trachoma, and the results in 259, or 35 percent, were in doubt.

There is still controversy among physicians experienced with trachoma as to the exact cause of the disease; however, the preponderance of opinion seems to be in favor of a virus belonging to the psittacosis-lymphogranuloma venereum group.

HEALTH EDUCATION

When Doctor McMullen undertook his work with trachoma there were many things unknown about the disease. However, by finding cases and taking the family as a unit with which to work, he demonstrated that treatment and education could accomplish remarkable results. Much of his health education work would now be considered as pioneering. It had to be. Some of it was teaching a mountain wife not to use one towel for all members of the family; that a person with sore eyes should not sleep with a person who did not have sore eyes. Very early in the beginning of his campaign in 1913, he prepared a simple statement entitled, "Trachoma, Its Nature and Prevention." Many thousands of copies of this pamphlet were distributed. These pamphlets were of value in disseminating knowledge about the spread and prevention of this disease.

THE FAITHFUL MULE

The work of the trachoma control project, especially during the early years, required strenuous physical exertion. Travel in some mountainous areas could be accomplished only by horseback, mule-back, or by walking. Doctor McMullen preferred to ride a sure-footed, wary, and sturdy mule. Even today he is a staunch advocate of their many virtues. He feels that his life was spared several times by the cautiousness and intelligence of the mules he rode. He strongly concurs in the sentiments expressed in the following poem:

In Justice to the Faithful Mule

In history and poetry, in music and in art
The horse has been a favored beast and played a leading part;
And while I don't begrudge him the fame that he has won,
There's been too little said about his sister's long-eared son!

We praise the foaming charger and we weave him in a song,
But how about the humble beast that hauls the grub along?
He snakes the heavy cannon over muddy field and road
And is never known to whimper or complain about his load.

In times of peace as well as war, the mule is not a shirk
When Dobbin takes a balky spell, it's Jasper does the work.
In many ways he proves himself much wiser than the steed,
He never takes an overdose of water or of feed.

And should he chance to run away when by ambition fired,
He always makes his dash with care and stops before he's tired.
I know there is a prejudice against this humble beast,
But those who hold him with disdain are they that know him least.

Investigate his record with a calm, unbiased mind,
And you will find as I have found that he has been maligned.
For even men who hold him up to scorn and ridicule
Might learn a wholesome lesson from the humble, patient mule.

—By Albert Stroud in the Kansas City *Star*.

SULFONAMIDES REVOLUTIONIZE TREATMENT

Doctor McMullen recalls that many times he discussed the trachoma project and its advancement with his co-workers and friends, particularly after he had walked several miles during hot weather, and how, in jest, he expressed the hope and belief that some day a drug for oral use (a pill, perhaps) would be developed that would cure trachoma and that all of the work and effort he was putting forth would no longer be necessary. The remark may well be characterized simply as wishful thinking. Yet, with the acceptance for medical uses of the sulfonamide group of drugs, together with improved standards of living and increased knowledge concerning personal hygiene, the wish is nearer fulfillment. (The sulfonamides are given in pill form and are frequently supplemented by local application as an ointment or in solution.) While trachoma is still a matter of public health concern in certain areas, its control and eventual eradication have been greatly simplified through the widespread use of sulfonamides.

The advances in chemotherapy and the resultant new drugs that are so effective in conditions like trachoma are welcomed, but they in no way minimize or detract from the pioneering work done by Doctor McMullen and his associates in carrying forward the early plan for the control and eradication of trachoma in this country.

Doctor McMullen was relieved of the trachoma detail and assigned by Surgeon General Hugh S. Cumming to other duties on November 1, 1924, after completing 11 years devoted to leadership of trachoma eradication in the United States.* Dr. Paul D. Mossman succeeded him in charge of the trachoma work; later Dr. Carl E. Rice was placed in charge of the program.

RESULTS OF CAMPAIGN

The trachoma campaign was initiated primarily in the interest of public health. It began in the Appalachian chain and the Ozarks among peoples isolated in those remote hills, caught in the eddy of time and denied the access to the modern progress of their neighbors. They were described by some as not ignorant but unlettered. These were the purest Anglo-American stock and, as John Fox, the author, says, "storage house of American loyalty." To know them was to admire their sturdy character.

It was important to teach them by precept and example. Children from isolated homes were admitted to the small trachoma hospitals and shown how to be neat and orderly in their homes. Nurses in this work were carefully selected, and they made unusual efforts to send these children home, not only cured of trachoma, but imbued with the spirit of carrying the ideas they had learned to their parents. They proved apt pupils and undoubtedly were the means of changing the old order for better living and better health. At some of these hospitals model sanitary privies were on display for all to see and understand the importance of their construction and use.

Curing the existing cases brought relief to these people who for so long had not received proper care and treatment for this tormenting, mutilating scourge. With characteristic remissions and exacerbations, trachoma lasts throughout a lifetime when permitted to pursue its course. Resulting deformities of the eyelids and other sequelae had kept children from school and added to the inmates of poor houses.

It is a source of satisfaction to all who participated to know that through this program many children were sent back to school, and many persons were released from institutions and were able to return

*Doctor McMullen retired from active duty in 1936.

to work to support their families and resume their accustomed place in the community. In some counties, poor houses were actually discontinued. The Public Health Service is proud of initiating and conducting this campaign against trachoma.

With the passage of the Social Security Act in 1935 and the inauguration of grants-in-aid to States for health work, the trachoma program was turned over to the individual States where it has been successfully carried on as required by conditions in each State concerned.

Malaria Investigations

The brilliant work of American sanitarians in Cuba and Panama convinced two U. S. Public Health Service officers that malaria control could be accomplished in the United States at a feasible cost. These officers were Dr. Henry R. Carter and Dr. Rudolph H. von Ezdorf, who started in a small way in 1912 and 1913 to come to grips with the problem by actual field work. Both had extensive experience with yellow fever and were considered experts on that disease. As a result of their studies, they became convinced of the necessity for, and the feasibility of, malaria control in the United States. At the suggestion of Surgeon General Rupert Blue, they testified in March 1914 before the Senate Appropriations Committee in support of an appropriation for the Public Health Service to be used for malaria and typhoid fever investigations; as a result the Congress made its first appropriation ($16,000) for malaria investigations in the United States.

Collection of malaria statistics was started in 1912 by Doctor von Ezdorf at Mobile, Alabama, and field studies of impounded water areas were made by Doctor Carter that same year in the Carolinas. Malaria investigations of the Service progressed as rapidly as available funds would permit, eventually reaching the point where they could be applied by the State or local health authorities for the reduction of this disease on a community-wide basis.

The Marine Hospital at Mobile in 1912 served as the first headquarters for malaria investigations of the Service. In November 1914, headquarters were transferred to the Marine Hospital, New Orleans.

Doctor von Ezdorf was in charge of field work until September 1916. On April 24, 1914, his malaria studies were interrupted by orders to

report on board the *USS Texas* en route to join the United States fleet at Vera Cruz, Mexico. Doctor von Ezdorf and Dr. Gregorio M. Guiteras there reported to the Commander-in-Chief of the U. S. Naval Forces, Rear Admiral Frank F. Fletcher, as consultants in sanitation. Subsequently, they were assigned to duty under Major General Frederick Funston upon the relief of the Naval Forces on shore by the Army. This assignment of Doctors von Ezdorf and Guiteras (April to August 1914) was at the request of Rear Admiral Victor Blue, then Chief of the Bureau of Navigation of the Navy Department, a brother of Surgeon General Rupert Blue of the Service. Engaged in arduous field work at Lincolnton, North Carolina, in September 1916, Doctor von Ezdorf died of a coronary attack while hurrying to shelter to avoid an approaching storm.

Dr. Henry R. Carter who had been temporarily in charge of field headquarters during Doctor von Ezdorf's absence in Mexico again assumed executive direction upon Doctor von Ezdorf's death. Dr. Robert C. Derevaux was in immediate charge at field headquarters. During the period of World War I, 1917 to 1919, all activities of the office were directed toward the control of malaria about military camps and industrial centers, with Doctor Carter in charge of work in Kentucky, Maryland, and Virginia; Doctor Derevaux in charge in southern Louisiana and Mississippi; and Sanitary Engineer Joseph A. A. Le Prince in charge in the remaining eastern and southeastern States. In addition, Mr. Le Prince had immediate supervision of all engineering matters.

On June 12, 1919, Dr. Lunsford D. Fricks assumed charge of the malaria peacetime activities of the Service with headquarters at Memphis, remaining in charge until March 1927. Under his direction great progress was made in solving many problems of malaria control, and in assisting the State health departments in the malaria belt to organize control programs.

Until his death in 1925, the wise counsel of Doctor Carter served to shape the course of activities into practical channels, and the zeal and untiring energy of Le Prince made possible much of the practical application of the investigative work. They overcame many seemingly insurmountable obstacles and inspired outstanding teamwork among medical men and engineers, scientists and technicians. The translation of

scientific facts into everyday, common practice was one of their outstanding accomplishments.

In March 1927, Dr. Louis L. Williams, Jr., long associated with the work of malaria control, was placed in charge with headquarters at Richmond, Virginia, later transferred to Washington, D. C. Under Doctor Williams, the malaria investigations of the Public Health Service played an important part in the development of the South by anticipating and finding solutions to problems as industrial development proceeded.

In 1941, Dr. Victor H. Haas was placed in charge, with headquarters at Memphis, bringing with him a stimulating research approach. Doctor Haas spent considerable time in Burma and China during 1941-1943, after which he again took active direction of the work. During the absence of Doctor Haas, Mr. J. Lynne Robertson, a sanitary engineer, was in charge. In 1948, Doctor Haas was transferred to larger responsibilities at the National Institutes of Health and was relieved by Dr. Thomas H. Tomlinson, Jr.

MALARIA PREVALENCE AND DISTRIBUTION

During the period 1912-1917, effort was directed toward determining where malaria was prevalent, and to what extent it constituted an economic problem locally. Return postal cards were sent to practicing physicians in malarious States requesting them to report their malaria cases. During 1913 and 1914 field trips were made to investigate malaria prevalence. Anopheline mosquito breeding, malaria incidence, and related matters were studied very closely. Several blood smear surveys were made to prove the existence of malaria and to determine species of parasites.

EARLY MALARIA CONTROL DEMONSTRATIONS

In 1913 the manager of a large cotton mill at Roanoke Rapids, North Carolina, requested the assistance of the Service to solve a severe malaria problem. A survey was made by Doctor Carter; a high malaria rate was found; heavy breeding of malaria transmitting anopheline species was taking place; and, as a result, a serious labor shortage existed at the mill. Malaria control measures carried out under the direction

of Service representatives, resulted in a considerable reduction in malaria; a complete solution to the summer labor shortage; and a large increase in efficiency.

A similar request for assistance was received from the physician of a lumber mill at Electric Mills, Mississippi, early in 1914. Surveys showed a high malaria rate and heavy anopheline production. Control work under the direction of a sanitary engineer of the Service during the summer of 1914 resulted in prompt reduction in malaria, with an accompanying increase in labor efficiency. These projects, both industrial, were the first demonstrations of malaria reduction in the United States by anti-mosquito methods. That the work actually paid a dividend is evidenced by the care taken to maintain the work in succeeding years by the companies themselves.

In 1915, the industrial towns of Lanett, Kaulton, and Holt, in Alabama, were given assistance in reducing mosquito breeding. During 1916, marked reductions in malaria rates were achieved.

In 1916, surveys were made at Wilson and at Emporia, Virginia, where very severe malaria epidemics had occurred. Extensive screening and quininization at Wilson, and drainage and oiling at Emporia resulted in the nearly complete disappearance of malaria.

Early in 1916, the International Health Board of the Rockefeller Foundation through its Director, Dr. Wickliffe Rose, requested the advice and assistance of the Service in selecting for future activities some project of world-wide significance. Malaria was suggested and he was invited to take part immediately in three demonstrations of malaria control in selected areas as an experiment to determine the relative merits of the different control methods then known. These demonstrations were financed by the Board, and the Service arranged to supervise the actual operations. Crossett, Arkansas, a mill village, had a reduction of 72 percent in malaria parasite rates taken after mosquito control had been accomplished at a cost of $1.23 per capita. The control work which had been initiated and conducted by Doctor Derevaux, was maintained thereafter by the industrial interests of Crossett.

Lake Village, Arkansas, a rural area, was selected as a demonstration of other control methods because drainage there was not considered feasible. The area was divided into two sections. In the first section houses were carefully screened; in the second, quinine was given regu-

(From USPHS Records)

Joseph A. A. LePrince (sanitary engineer) and an assistant examining a swampy area for ANOPHELES *mosquito production.*

(From USPHS Records)

Conference, U. S. Public Health Service Sanitary Engineers, Cincinnati, Ohio, May, 1928.

FIRST ROW (Left to right): Ralph E. Tarbett, William C. Purdy, Frederick J. Moss, Emery J. Theriault, Harold W. Streeter, Herbert D. Cashmore. SECOND ROW: Charles T. Carnahan, H. Norman Old, J. Lynne Robertson, Leonard Greenburg, Charles T. Wright, Lawrence M. Fisher, Isador W. Mendelsohn, Abraham W. Fuchs. THIRD ROW: Arthur P. Miller, Omar C. Hopkins, Arthur L. Dopmeyer, Edmund C. Sullivan, Elliott H. Gage. FOURTH ROW: John K. Hoskins, Milton V. Veldee, Harry R. Crohurst.

larly to all members of the family. At the end of the malaria season a reduction of 70.6 percent in malaria parasite carriers had occurred in the screened group; and in the group given quinine a reduction in parasite carriers of 64.4 percent was shown.

These demonstrations showed that malaria could be reduced by at least three different methods, namely: Screening, mosquito abatement, and administration of drugs, and that the method of choice depended on local conditions. In many instances a combination of methods was indicated.

ANOPHELES MOSQUITOES

In 1912, little was known about the details of malaria transmission. It was assumed that all species of *Anopheles* might transmit the disease, and control measures accordingly were directed against all anopheline species. In the United States, three important *Anopheles* are found in the Southern malaria belt: *Anopheles quadrimaculatus, A. punctipennis,* and *A. crucians.*

It was first noted during work in the Carolinas that, while there might be present a heavy infestation of *A. punctipennis,* malaria prevalence might be relatively light. This called attention from an epidemiological standpoint to the questionable role of this species as a malaria carrier. Dr. Bruce Mayne* at Scott, Mississippi, in 1915 and 1916, after many failures corroborated the infectivity of both *A. punctipennis* and *A. crucians* to *Plasmodium vivax,* and succeeded in infecting humans by the mosquito bites. Later in 1916, he infected *A. punctipennis* with *P. falciparum* and also found infected *A. punctipennis* in nature.

Mayne infected *crucians* late in 1915 and at Monroe, Louisiana, in 1917 he found one *A. crucians* and 17 *A. quadrimaculatus* infected in nature. However, subsequent observations indicated that association with humans by *A. quadrimaculatus* incriminated this mosquito as the principal vector of malaria in the southern United States.

As a result of his infectivity and dissection experiments, Mayne concluded that the malaria parasite overwinters in the human host and the *Anopheles* mosquitoes become infected in the spring before they can transmit the disease.

*Born M. Bruin Mitzmain.

Mr. Le Prince and Dr. Thomas H. D. Griffitts, near Ft. Lawn and North Augusta, South Carolina, in September 1914, began studies of the flight range of *A. quadrimaculatus.* Before this, practically no information was available on the flight range of American *Anopheles.* Large numbers of *A. quadrimaculatus* were caught, stained with anilin dye, and liberated at a certain point. Daily catches to capture stained specimens were then made in houses within a radius of two miles. The results of this work showed that where the production of the species was profuse, flight in quantity extended approximately a mile from the breeding place; with less prolific production, flight of importance extended to only about one-half mile from the source of production. This was the first instance of a scientific study in regard to the flight range of American *Anopheles.* This information was of immense value later in planning and conducting malaria control.

IMPOUNDED WATERS AND MALARIA

Late in 1913, Doctor Carter urged that a detailed study be undertaken to determine the relationship of impounded waters to malaria, so that a policy, with regard to the creation of water impoundments could be formulated which would prevent the introduction of health hazards. As a result, in July 1914, Doctor Carter was placed at the head of a field party to investigate the whole matter.

Studies consisted of physical and biological surveys of existing areas with ponds and of areas about to be impounded. These studies, with some interruptions, were conducted from year to year, and with the greatly increasing size of the impoundments contemplated, it was recognized that the theretofore accepted control measures applicable to them were rapidly becoming obsolete. It was obvious that new methods must be developed, and this phase of the work became of considerable importance over a long period of time. Early investigations showed in general that malaria transmitting mosquitoes were numerous near impounded waters, and that the fine flotage collecting in bights and inlets formed ideal breeding places for the larvae of *A. quadrimaculatus.* These observations led to the practice of the removal of trees, brush, and floatable material (raftforming) in the area of the proposed basin. Later, it was suggested that the water level be held at a maximum dur-

ing the winter or non-anopheline season, and that it be lowered in successive steps during the summer, in order that flotage might be stranded along the water edge of impoundments, thus keeping a clean shore line. This assisted in the establishment of natural biological balance in ponds, attained through the action of a natural predator such as fish that destroy mosquito larvae.

Impounded water studies were never deemed complete, because new facts constantly arose out of each new project. However, these investigations progressed to a point where sufficient facts were accumulated to form the basis of State and Federal regulations for impounded projects.

SUMMARY OF THE PERIOD 1912-1917

Broadly, the work of the Service in the field of malaria and its control up to World War I consisted of investigations of the economic losses caused by the disease; feasibility of the different methods of control; studies of American anophelines in regard to their importance in malaria transmission; and studies of malaria resulting from impounded water.

The areas over which malaria was causing heavy economic losses were fairly well determined, and carefully conducted programs suggested by the Service for the control of the disease were applied with excellent results generally. Observations and studies showed that due to its habit of associating indoors with humans, *A. quadrimaculatus* was the main carrier of the disease. In short, the fundamental facts connected with malaria transmission and control in the United States had been worked out and actually applied to a degree which practically assured the success of the extensive work which was carried out about the military cantonments in the southern States during the period of World War I.

MALARIA CONTROL WORK DURING WORLD WAR I

When the United States entered World War I in 1917, large training camps were constructed at various locations over the country. Many of these camps were located in southern States because of the relatively mild winters.

To protect against malaria, drainage and larviciding for mosquito control were done within a radius of one mile from each of the camps

situated in endemic areas, and in most instances these measures were extended to include the cities and towns where troops were likely to spend their off-time.

Many of the camp sites were so situated that a large amount of major drainage work was immediately necessary, and a huge task confronted the Service. To save time, the use of dynamite was resorted to in many areas for the construction of the larger ditches, and while the use of explosives for this purpose was not new, the method became highly developed. A marked reduction in their malaria sick-rate occurred at the military camps, following the institution of control measures.

DEVELOPMENT OF THE 1920-1923 COOPERATIVE PROGRAM

Because of World War I activities, a large number of engineers, technical assistants, and others had become well trained in the methods of anti-mosquito work. With the close of war activities, this personnel became available for peacetime employment. In order to afford an exchange of ideas and to promote the common interest of this group of men, a conference was arranged at Wilmington, North Carolina, in February 1919. This conference served to standardize and establish the practicability of the methods practiced during the war period, and to bring about a better understanding of the possibilities of malaria control in organized health work in the South. Publications of this and succeeding conference reports of malaria field work have been of immense service in popularizing the malaria control operations conducted by the State health departments of the malaria belt.

Upon taking charge of malaria investigations in June 1919, Dr. Lunsford D. Fricks at once began to formulate comprehensive plans for the utilization of this trained personnel from wartime activities. During late 1919, plans were perfected whereby the International Health Board of the Rockefeller Foundation agreed to assume the salaries and traveling expenses of many of the men and thereby cooperate with the Service in carrying out a proposed plan for urban malaria control demonstrations, mainly by anti-mosquito methods. The aim of these demonstrations was to popularize malaria control work and to form a nucleus about which the State health departments could build up malaria control programs and in time care for their own problems. To this end, it was

agreed that Service personnel should supervise the actual field work; that it should be done under the aegis of the State health department; that the towns selected would be expected to appropriate part of the necessary funds after a survey had shown the work to be economically feasible; and that written contracts should be signed by all cooperating agencies assuring continuation of the work.

This program of "Cooperative Malaria Control Demonstration" was carried out during 1920, 1921, and 1922. Additional towns were selected each year, and an attempt was made to select towns that were likely to continue the work after the cooperating agencies withdrew support. In a majority of instances, periodic supervision was provided the selected towns during the second year of their activities.

In 1920, 43 towns in 11 southern States participated in this arrangement. Almost 200 square miles of actual land area were placed under control of *Anopheles* breeding, affording protection to more than 200,000 people at a per capita cost of 81 cents. Of these towns, 37 continued the work in 1921 at a per capita cost of 25 cents. In 1921 and 1922, 36 towns were included in the cooperative work.

Practically all of these projects were successful demonstrations of malaria reduction by well-proven methods. Many of these towns continued the work from year to year, as a regular part of their civic activities. With this modest start the State health departments in the malaria belt gradually were able to assume responsibility for encouraging and assisting local communities to control malaria.

RAILROAD SURVEYS

The first survey of malaria along a railroad by the Service was undertaken during the winter 1916-1917 and extended some 1,800 miles, from St. Louis through Missouri, Arkansas, Louisiana, and Texas. An analysis of the available hospital records and records of private physicians in the territory traversed showed that malaria was the most important disease occurring in the locality and that it constituted at the time, as much as 50 to 75 percent of the practice of the physicians.

Because this was an economic handicap, the St. Louis and Southwestern Railroad assisted the cities along its route with anti-mosquito campaigns. Mr. Henry W. Van Hovenberg was assigned to assist the

railroad in this work in 1917, and on March 15, 1919, the railroad engaged him to direct this new activity in industrial preventive medicine. In 1919, the Central of Georgia Railroad officials made a request for a malaria study along its lines in Georgia and Alabama. The survey was made by Service engineers and as in the case of the St. Louis and Southwestern, there was found an enormous loss from ill-health and decreased revenues due directly to malaria. The railroad undertook drainage and screening work for the protection of its employees. During 1921, 1922, and 1923, at the request of the various State health officers concerned, and railroad officials, surveys were made of the portions of the Illinois Central System, the Missouri Pacific, the Seaboard Air Line, and the Rock Island Lines. Considerable loss in potential revenues was indicated in the malarious sections of these roads, and recommendations were made for minimizing this loss, based on the successful experience of the St. Louis and Southwestern Railroad and the Central of Georgia Railroad.

COOPERATIVE STUDIES WITH THE BUREAU OF FISHERIES

The use of minnows *(Gambusia affinis)* to destroy mosquito larvae received some attention at the beginning of the century, and accounts of this work can be found in the annual report of the New Jersey Agricultural Experiment Station for 1904. Dr. George W. McCoy states that he used *Gambusia* in Honolulu in 1911 against pest mosquitoes, on the suggestion of David Starr Jordan, later President of Stanford University.

In 1915, Dr. Henry R. Carter wrote that in the impounded waters of a power plant at Blewetts Falls, North Carolina, small fish were widely distributed in the quiet waters where mosquitoes were most likely to breed. While he did not give an estimate of the value of these fish as anti-mosquito agents, it is to be inferred that he considered them to be of some use. The use of fish as mosquito-control agents in impounded waters was also referred to by Le Prince and Griffitts in 1916.

In view of the apparent value of small fish for destroying mosquito larvae, the Service in 1918 requested the assistance of the Bureau of Fisheries and asked for the assignment of an ichthyologist to cooperate in a study to determine the true value of fish as mosquito destroying agents. The Bureau of Fisheries loaned the services of Mr. Samuel F.

Hildebrand, who began his studies at Hancock near Augusta, Georgia. Mr. Hildebrand soon came to the conclusion that the top minnow (*Gambusia affinis*) indigenous to the area was an extensive larvae eating fish.

Gambusia were used extensively in the demonstrations of 1920-1923, and they are now an important means of mosquito reduction and malaria control in impounded waters. The use of *Gambusia* has been introduced into Italy, Spain, North Africa, Palestine, Santo Domingo, Argentina, Philippine Islands, and many other countries.

PARIS GREEN (COPPER ACETOARSENITE)

In the course of experiments carried out in Camilla, Georgia, in 1921, in quest of a larvicide which could be applied as a dry powder and float on the water surface, Dr. Marshall A. Barber, a biologist, and his associates, Theodore B. Hayne and William H. W. Komp, the latter an entomologist, after trying several hundred compounds, developed the use of paris green as a mosquito larvicide. The original recommendations were to use 1 : 100 mixture by volume of paris green with an inert powder, such as road dust, talc, or lime. This mixture could be dusted on mosquito breeding areas by hand. It proved effective on large swamps and on areas densely overgrown with grasses and other aquatic vegetation, where oil could not be used. Its use was developed for many different situations, and it proved successful in nearly all.

In developing the use of paris green, Sanitary Engineers Joseph A. Le Prince and Henry A. Johnson worked out the use of mechanical equipment, such as hand-operated dusters and power blowers so that the larvicide could be applied to shorelines from small boats. In 1926, Dr. Louis L. Williams, Jr., in cooperation with the U. S. Marine Corps at Quantico, Virginia, demonstrated the use of airplanes for distributing paris green over large areas of aquatic vegetation.

The discovery of paris green as an anopheline larvicide filled a long-felt want, and its use spread to all malarious parts of the world. The eradication of *Anopheles gambiae* from Brazil was effected almost solely by the use of this larvicide.

Doctor Barber's work with the Service was productive of many outstanding discoveries in addition to paris green. In 1927 he discovered

the unique ability of Pamaquin (plasmochin) to prevent infection of *Anopheles* when the drug was given to persons harboring the infective forms of the malaria parasite. His name is associated with investigations from 1921 to 1929 covering the infection rate of the anophelines of the southern United States, the prevalence of malaria and *Anopheles* in rice-growing regions, the flight-range, longevity and breeding-places of *Anopheles,* and other aspects of their biology and relation to malaria. Doctor Barber improved various techniques for the study of malaria, and in 1924 began investigations which led to the development of the mass staining of blood film for identification of malaria parasites, which made possible large-scale surveys to determine malaria incidence by examination of the blood. The method has been improved and extended particularly through the efforts of Miss Aimee Wilcox, and is the standard procedure for determining malaria parasite rates.

SCREENING

In 1924 a study was undertaken in Leflore County, Mississippi, to determine the possibility of screening rural homes as a protection to plantation labor against malaria. During that year Dr. Charles P. Coogle of the Service, who was in charge of the study, carefully screened 20 homes, using a simplified and economical method, including an inexpensive type of screen door. The interest aroused and the resulting decrease in the *Anopheles* infestation of screened homes was so marked that additional groups of homes were screened in 1925 and 1926. The response of the tenants of the screened houses was so favorable that in 1927, an area of 40 square miles was selected in which 500 homes were screened as an experiment. The effectiveness of screens demonstrated by these experiments proved an immense stimulation to the screening of homes throughout the South.

DITCH LINING

The development of durable ditch linings for the prevention of standing water and anopheline mosquito breeding in earth ditches was initiated by Dr. Thomas H. D. Griffitts of the Service in Mobile, Alabama, in 1922. This innovation was a great boon to those engaged in maintaining malaria control drainage systems and resulted in decreased

over-all cost of malaria control by this method. LePrince and Henry A. Johnson supervised the installation of experimental concrete ditch lining in cooperation with the city of Memphis in 1931. In 1935, Le Prince and Johnson started a study of ditch linings to control mosquito breeding, and hundreds of miles of such linings were installed through the efforts of the State health departments in the years following. These installations served to reduce or limit the costly and continuing summer oiling programs.

Following the discovery of DDT, Doctor Barber and Mr. Frederick L. Knowles played an important part in its development as a larvicide and insecticide, and showed in a large rice-growing area the effectiveness of the material when used as a residual wall spray in houses to kill adult mosquitoes in their daytime resting places.

LABORATORY STUDIES

The staining and examination of approximately 225,000 thick blood films taken in surveys, principally in the southeastern section of the United States, was a part of the laboratory work done from 1928 to 1939. Miss Aimee Wilcox was responsible for this work. During the period 1928-1941, she also trained about 800 other persons in the staining and examination of thick blood films.

A "Manual for the Microscopical Diagnosis of Malaria in Man," prepared by Miss Wilcox, was published in 1941. This manual was used extensively by the armed services in World War II, and is still used in parasitology classes of medical schools and technicians' schools, as well as in diagnostic laboratories both in the United States and abroad.

The correct classification of the Caribbean Anopheles was clarified by an entomologist of the Service, William H. W. Komp, after several years of intensive study. In a cooperative study from 1931 to 1946 between the Service and the Gorgas Memorial Laboratory in Panama, Mr. Komp, with Dr. Herbert C. Clark, Director of the Gorgas Laboratory, found that suppression of clinical symptoms of malaria with quinacrine (atabrine) was possible, but that prevention of infection was not.

A laboratory to study malaria and its use in work with paresis was set up in Columbia, South Carolina, in 1931 by Mayne. Later, the work of this laboratory was broadened to study antimalarial drugs and re-

lated subjects. Work was started on the problem of the epidemiology of human malaria, using as an investigational method the inducing of malaria in neurosyphilitic patients. Particular emphasis was placed on the transmission of malaria by inoculums of sporozoites suspended in various media.

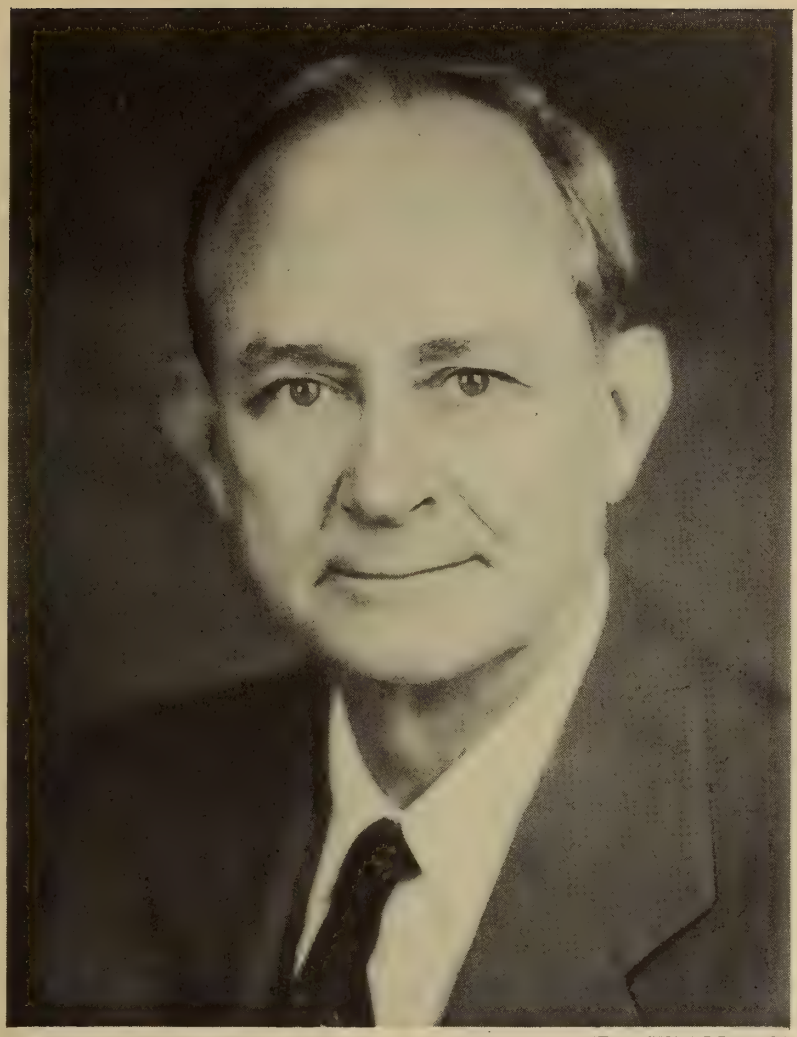
On June 17, 1937, Dr. Martin D. Young, and the following winter Dr. G. Robert Coatney, joined the staff. These two scientists expanded the work to investigate many parasitological phases of malaria. Dr. Bruce Mayne died in the spring of 1941. By this time Doctor Coatney had been transferred to Washington and Doctor Young assumed charge of the laboratory, which has been under his direction since. In 1942, Dr. Robert W. Burgess, an entomologist, was added.

With the advent of World War II, an intensive investigation was begun on the impact of foreign malarias being introduced into this country. Studies on returned military personnel infected with foreign malarias were conducted cooperatively in 10 Army and Navy hospitals. It was shown that these foreign malaria strains readily infect native vectors in the United States and are transmissible by them. It was thought that possibly this would result in a pronounced upswing of malaria cases in this country following the War, but fortunately this has not occurred.

As malaria became less of a public health problem in the United States from 1942 onward, major emphasis was directed toward experimental work designed to obtain more fundamental information about the malaria parasite, particularly from the standpoint of its intimate relationships with host animals, both vertebrate and invertebrate. At the Memphis laboratory the avian malaria parasite, *Plasmodium gallinaceum* was used in these studies, and a number of publications were issued dealing with fundamental aspects of the experimental disease.

CAMPAIGN INTENSIFIED

In 1937, Dr. Louis L. Williams, Jr., advocated two steps to strike blows to malaria in the United States, first that State health departments in the malarious South organize, among their staff members, Malaria Control Units comprised of physician-entomologist-engineer teams; second, that the final attack be pressed against the remaining foci of the



(From USPHS Records)

Dr. Louis L. Williams, Jr.

disease. These, it was apparent, existed as scattered malarious "islands."

These two important procedures did much to break the grasp of malaria in the South. In the late 1940's malaria in the United States was considered by health authorities as having all but disappeared. In fact, reported cases of the disease are regularly investigated by epidemiological teams in an effort to determine whether or not they constitute primary cases.

During the relief made-work programs which commenced in the depression period beginning in 1933, the Service had close cooperation in the CWA, ERA, and WPA programs. In connection with these relief projects, more than 30,000 miles of malaria control drainage ditches, large and small, were under Service supervision, and approximately 625,000 watered areas were drained under approval of the Service.

Service officers specializing in malaria control often have been called upon to render assistance in various parts of the world in combating the disease. Dr. Louis L. Williams, Jr., Dr. Bruce Mayne, and Dr. Hiram J. Bush in 1939 worked with the Chinese Government in the suppression of malaria along the Burma Highway. Wm. H. W. Komp was assigned to the Institute of Inter-American Affairs as consultant on malaria in 1942, and advised the field-parties operating in Central and South America on their malaria control projects until 1947.

MALARIA CHEMOTHERAPY INVESTIGATIONS

The program of malaria drug research at the National Institute of Health began in June 1938. The Laboratory of the Committee on Drug Addiction of the National Research Council at the University of Virginia, headed by Dr. Lyndon F. Small, was soon to be transferred to the Public Health Service.

The laboratory under Doctor Small's direction became a field station of the Public Health Service on January 1, 1939, and moved to the National Institute of Health in Washington in September 1939. Because of the lack of testing facilities it was not until March 1941 that the first of the accumulated new drugs actually came to test against *Plasmodium cathemerium* in canaries, in the laboratory established under the direction of Dr. Maurice A. Roe.

In the spring of 1941 it seemed desirable to place special emphasis on the chemotherapeutic aspect of malaria investigations. A conference on the chemotherapy of malaria held under the auspices of the Division of Medical Sciences of the National Research Council in Washington, D. C., was conducted in July 1941. Drs. Lyndon F. Small, Maurice A. Roe, G. Robert Coatney, and William Henry Sebrell, Jr., represented the Service. Between May 1942 and the creation of the Subcommittee on the Coordination of Malarial Studies in December 1942, there were several committees, with representatives from the Service, to deal with special problems.

In December 1942 the Subcommittee on the Coordination of Malarial Studies was set up in the National Research Council with three panels. Doctor Small served on the Panel on Synthesis, and Doctor Coatney on the Panel on Pharmacology.

The Board for the Coordination of Malarial Studies was established in 1943. Dr. William Henry Sebrell, Jr., and Dr. G. Robert Coatney were named to represent the Service on this Board, and served throughout the War. Panels were organized to carry out specific phases of the work. Doctor Coatney served on the Panel of Pharmacology of Antimalarials, Dr. W. Clark Cooper on the Panel of Clinical Testing of Antimalarials, and Dr. Lyndon F. Small on the Panel of Synthesis of Antimalarials.

Up to January 1942 practically all the work related to the chemotherapy of malaria at the National Institute of Health was under the general direction of Doctor Small, but with the expanding program it was decided to separate the purely chemical work from the rest of the program. The testing program in lower animals and in man became the responsibility of Doctor Coatney.

The early tests of potential antimalarial drugs were made against *P. cathemerium* in the canary, but when *P. gallinaceum* became available late in 1941 the testing in lower animals was changed to this parasite in young chicks. The first important discovery came early in 1942 when Coatney and Cooper found that sulfadiazine, and later other sulfa compounds also, acted as true causal prophylactics against *P. gallinaceum* in the chick, although later studies showed that this discovery failed to carry over to human malaria. Altogether more than 2,500 compounds were screened for therapeutic and true prophylactic effect.

Because of the rather large number of compounds showing antimalarial activity in lower animals, human testing facilities were set up. With the assistance of Dr. Winfred Overholser, Superintendent of St. Elizabeth's Hospital in Washington, D. C., the first unit was established there. Dr. W. Clark Cooper was placed in charge of this unit and had general supervision over other clinical testing units to be dealt with later. Dr. Martin D. Young assumed the responsibility of supplying infected mosquitoes for this project and this arrangement was continued at subsequent installations.

By the summer of 1943 the St. Elizabeth's facilities were no longer adequate. With the cooperation of the Federal Bureau of Prisons a unit was set up in the Atlanta Penitentiary hospital where Dr. George Hess was Chief Medical Officer. Dr. David S. Ruhe was in immediate charge of the unit. The first patients were infected with malaria on March 17, 1944. During the life of this unit 132 volunteers were infected. The first definitive studies on chloroquine, now the recognized drug of choice for the treatment and suppression of malaria were carried out at this installation.

In 1946, although the main emergency had passed, it was decided to continue certain lines of investigation, especially attempts to find drugs of low toxicity that would act as truly curative agents or as prophylactics. Since adequate numbers of volunteers were no longer available at Atlanta, the unit was moved to the Federal Correctional Institution, Seagoville, Texas, and placed under the immediate charge of Dr. William B. Culwell. This unit was closed on June 30, 1950; a total of 270 volunteers were infected with *vivax* malaria at this institution.

Great credit is due the 402 inmate volunteers for their cheerful adherence to a prolonged and arduous schedule of observation, with repeated laboratory procedures, recurrent attacks of malaria, and the hazards and discomforts of therapy.

Although the initial objectives were not fully realized these studies yielded notable contributions to the fundamental biology of the parasite, advanced knowledge of the curative potentialities of the 8-aminoquinolines, and stressed the phenomenon of drug-resistance to chlorguanide.

In 1948 the Public Health Service entered into a cooperative study with the Pan American Sanitary Bureau and the Guatemalan Government to appraise the general usefulness of chloroquine and chlorguanide (paludrine) as suppressive agents in a native population with a malaria incidence of approximately 30 percent. This study was under the direction of Dr. Charles G. Dobrovolny, and was concluded June 30, 1950. Approximately 3,200 people took part in the study; chloroquine was found to be superior to chlorguanide.

Stream Pollution and Related Investigations

STREAM POLLUTION AND EPIDEMICS

Because of the frequent explosive outbreaks of typhoid fever in urban areas and the high morbidity and mortality rates in cities attributed to water supplies in the early 1900's, the pollution of interstate rivers and lakes demanded prompt attention. Remedial action was difficult because, in keeping with constitutional interpretation, it was considered at that time to be the responsibility of the several States. In search for some solution, the law enacted in 1912 expressly authorized the Service to conduct investigations of pollution of navigable waters.

Stream pollution investigations date from 1910, when Dr. Allan J. McLaughlin was detailed to make a survey of cities in the Great Lakes region, with instructions to investigate the extent of pollution of their water supplies, and its relation to the prevalence of typhoid fever and other water-borne diseases. During the summer of 1912, Doctor McLaughlin was detailed to survey sewage pollution in the Missouri River. In this work he was enabled, through cooperation of the health authorities of the bordering States and cities, to establish several laboratories and make extensive series of bacteriological examinations. When this work had been completed, Doctor McLaughlin was granted leave of absence from the Service and was appointed as Chief Sanitary Expert for the International Joint Commission, which had been established under a treaty between Canada and the United States and had taken up the question of regulating the pollution of the international boundary waters.

In the meantime, Congress, by the Act approved August 14, 1912, had extended the functions of the Public Health Service to include, among other duties, investigating "the diseases of man and conditions influencing the propagation and spread thereof, including sanitation and sewage and the pollution, either directly or indirectly, of the navigable streams and lakes of the United States." In 1913, the first special appropriation for field investigations by the Service was made by Congress. The Service was thus enabled to establish field laboratories and employ scientific personnel at points most suitable for special investigations of this and other problems.

STUDIES INAUGURATED

A small group of sanitary engineers, medical officers, chemists, biologists, and bacteriologists was assembled by the Public Health Service in the summer of 1913, and a start was made with a concerted plan of stream pollution investigations. As originally organized, the work undertaken was comprised of the following main divisions:

1. Studies of the biochemistry of sewage and industrial wastes at the Hygienic Laboratory were conducted under the direction of Professor Earle B. Phelps, then Chief of the Division of Chemistry in the Laboratory. These studies were designed to test and develop the application of biochemical oxygen-demand determinations to the measurement of the potential polluting effect of sewage, and the capacity of streams for its natural oxidation, a field in which Professor Phelps had already made notable contributions.

2. Closely allied with these studies, also under Professor Phelps' direction, was a series of studies in the field, by Harry B. Hommon, a sanitary engineer, through experimental installations, to devise better methods of treating various types of industrial wastes for which effective methods had not been previously devised.

3. Under the direction of Dr. Hugh S. Cumming, later Surgeon General of the Service, a study was undertaken of the pollution and natural purification of the Potomac River, as representing a typical tidal stream, receiving the sewage of the city of Washington, and having in its lower reaches important shellfish beds. This study, begun in 1912 and completed in 1914, was extended as a survey of various other coastal waters, with special reference to the contamination of shellfish beds.

4. Under the direction of Dr. Wade H. Frost, a survey was begun in 1913 of the pollution and natural purification of the Ohio River, as representing a typical large inland stream, receiving mostly untreated sewage from the cities on its watershed.

Headquarters for this survey were established at Cincinnati, Ohio, using the buildings and grounds formerly operated as a Marine Hospital, with temporary branch laboratories at five other points on the river.

At the time of these early investigations, stream pollution was widely recognized as an increasingly serious problem in the United States, but little was known as to its more fundamental aspects. Natural purification of streams, for example, was still a controversial question during the period of 1900-1910. Some observers viewed this phenomenon as being a major element in the progressive improvement noted in the sanitary conditions of our larger rivers. Others ascribed such improvement mainly to dilution. Practically no definite information was available in 1910 as to the extent of self-purification in streams, or as to the basic factors modifying its rate of progression under different physical and biological conditions. Many people believed an old adage that streams purified themselves in every "seven miles," or thereabouts. It remained for the Potomac and Ohio river studies to demonstrate for the first time in a quantitative manner that the self-purification of natural streams is governed by a definite set of laws, in which time rather than distance is the controlling element, and that certain other conditions, including temperature, sedimentation and scour, and relative density of pollution, tend to modify the rate of stream improvement. This was perhaps the outstanding achievement of these two closely related investigations, which paved the way for further advances in scientific knowledge of this phenomenon. It pointed to the fact that stream self-purification, if rightly utilized, is an economic asset of tremendous importance in any plan of stream sanitation.

OHIO RIVER STUDIES

In the Ohio River studies, attention was devoted to measuring the effects of sewage pollution on the river, both in terms of bacterial content and in those of biochemical oxygen demand. These effects were correlated with sewage-contributing populations in the larger metropolitan centers such as Pittsburgh, Cincinnati, and Louisville as the first step in deriving basic contributions in these terms per unit of population. An interesting sidelight on this phase of the studies was the observation

of a seasonal variation in the numbers of coliform bacteria contributed to the river as sewage per unit of population, the number being higher during the summer season. Another noteworthy observation was that of an increase in bacterial content of the river below major sources of pollution to a well-defined maximum, followed by a decline along a curve of the familiar "die-away" type. Contributing to the results of these studies, and to those of natural purification in the river, were the combined efforts of Doctor Frost, Professor Phelps, Sanitary Engineers John K. Hoskins, Harold W. Streeter, and Ralph E. Tarbett; likewise Bacteriologist Chester T. Butterfield, Biologist William C. Purdy, and Chemist Emery J. Theriault. Mr. Purdy contributed a separate report on the biology of the river, including bottom sediments. Professor Phelps and Mr. Streeter contributed a special report on oxidation phenomena in the river, including the original formulation of the basic law of the biochemical oxygen-demand reaction and its temperature coefficient, and the development and formulation of the well-known "oxygen sag" curve. The main report of the investigation, published as *Public Health Bulletin* 143, in July 1924, has remained a classic contribution in its field, on which much of the subsequent work in stream surveys, both by the Service and by other agencies in this country and abroad, has been based. Collaborating in this report were the individuals above named, together with District Engineer C. E. Ellsworth of the U. S. Geological Survey, whose services were loaned in connection with the hydrometric studies of the river.

Important features of the Ohio River investigation were field sanitary surveys of all cities located on the Ohio River, regardless of their size, and an extension of this survey to other communities in the Ohio River Basin, and later to a selected number of towns and cities in the New England States. The original purpose of these surveys was the ascertainment of various local sanitary conditions affecting stream pollution, and also an appraisal of the status of water-borne disease in each community as affected by these conditions. The field work, a task of great magnitude and complexity, was carried out by two field parties, one consisting of Dr. Lewis R. Thompson and Sanitary Engineer Ralph E. Tarbett, and the second, of Dr. Liston Paine and Sanitary Engineer John K. Hoskins. The survey of communities along the lower section

of the Ohio River proper was carried on by means of a houseboat equipped for the purpose. A third field party, consisting of Dr. Howard F. Smith and Sanitary Engineer Walter G. Stromquist, was organized later and participated actively in the surveys. During the winters of 1914-15 and 1915-16, the members of these parties, together with Dr. Allen W. Freeman, made a thorough analysis of the findings, and prepared a report which became part of the record of the investigation. Through an unfortunate combination of circumstances, this report was not published, and the original records were destroyed by a fire at their place of storage in Baltimore. These surveys were extended during 1915-1917 to cover the principal watersheds of the New England and North Atlantic States. A permanent contribution of the surveys, however, was a survey form and rating schedule, the first of its kind to be developed in the United States, which later was used in amplified form by the American Public Health Association and the Metropolitan Life Insurance Company in a study of health conditions and sanitation in cities over 100,000 population throughout the United States. Eventually, it served as the basis for the present appraisal form used by the American Public Health Association in rating health conditions in cities of the United States.

INVESTIGATIONS EXPANDED FOLLOWING WORLD WAR I

Interrupted by World War I, stream pollution studies were resumed in 1919, with headquarters at Cincinnati, first under the administrative direction of Dr. Paul Preble and then of Mr. Tarbett. The first major field project undertaken was in 1921-1922, consisting of a study of the pollution and natural purification of the Illinois River, which had been for some years a subject of controversy between the Sanitary District of Chicago and the States bordering the Great Lakes. A third party to this controversy was the State of Missouri, which claimed damage to the water supply of St. Louis because of the diversion of Chicago's then untreated sewage through the Illinois River and the Chicago Drainage Canal. The Service was invited, as a disinterested agency, to survey this problem with a view to establishing a reasonable basis for diversion of dilution water from Lake Michigan. This survey, made under the immediate supervision of Mr. Hoskins, confirmed and amplified many of the

conclusions derived from the Ohio River studies concerning the basic factors involved in the pollution and self-purification of large rivers.

Shortly after reorganization of the stream pollution investigations in 1919, Surgeon General Blue requested Dr. S. A. Forbes, Dr. Edwin O. Jordan, Mr. Langdon Pearse, and Professor Earle B. Phelps to serve as members of a consulting group in studies of stream pollution. Subsequently, Mr. Joseph W. Ellms consented to act as a special consultant in studies of water purification processes, and Dr. Lowell J. Reed, as an additional member of the board of consultants. The Service thus was enabled to obtain the authoritative advice of a notable group of experts who, meeting once or twice each year with the staff of the Cincinnati Field Station engaged in these investigations, rendered generous and valuable assistance in shaping plans, reviewing methods, and interpreting results.

Though separated from the Cincinnati headquarters of stream pollution investigations because of his detail to serve with the newly established School of Public Health at the Johns Hopkins University, Doctor Frost continued in charge of the Cincinnati station until Mr. Hoskins' appointment to that position following completion of the Illinois River Survey, and thereafter maintained close touch with the work up to the time of his death in 1938. It was largely due to his leadership, organizing ability, scientific insight, and tireless devotion that the work of the Cincinnati station gained world-wide recognition during the period of 25 years from its inception up to the time of his death. His exceptional powers of critical analysis, and his high ideals of scientific and personal integrity, left an indelible imprint on the minds of those who were so fortunate as to have worked with him.

GREAT LAKES AND UPPER MISSISSIPPI RIVER STUDIES

During the period of 1920-1930, the Cincinnati station's staff experienced one of the most active and productive efforts in its history. In addition to the publication of final reports on the Ohio and Illinois river investigations, two other major water pollution surveys were carried out, and full reports were published. The first was a study of pollution in the southern end of Lake Michigan under the direction of Sanitary

Engineer Harry R. Crohurst and Dr. Milton V. Veldee. The second was a study of the sanitary condition of the upper Mississippi River under Mr. Crohurst's direction. The former revealed conditions which led to an intensive effort to correct both sewage and industrial wastes pollution along the southern shore of Lake Michigan by the States of Illinois and Indiana. The latter resulted in a joint project, completed several years ago, whereby the cities of St. Paul and Minneapolis have constructed and are operating extensive sewage treatment works for correction of highly insanitary conditions below the Twin Cities.

SEWAGE TREATMENT PLANTS

Two other major field projects, both of a special nature, were carried out during this period. The first, completed in 1920, consisted of a study of the results obtained at 15 representative sewage treatment plants located in different parts of the United States and embracing a wide range of treatment processes. This study was planned and supervised by Harry B. Hommon, and was unique in that it was carried out in one summer (1920) by three separate field parties, with portable laboratory equipment, to make the same essential analyses of raw and treated sewage from each plant visited. Pertinent design and operation data, as well as information concerning special functions and problems, were collected on the ground by the three field parties, which consisted of Sanitary Engineer Herbert H. Wagenhals, Chemist Emery J. Theriault, and Chemist Michael J. Blew, all of whom were attached to the Cincinnati station. The report of this study, published under the authorship of Messrs. Wagenhals, Theriault and Harry B. Hommon, received wide attention both in this country and abroad, being the first of its kind based on a comprehensive survey with comparable laboratory data. This report is still used as a reference work by many State and local public health agencies, as well as consulting engineers. This work has not been repeated or duplicated since.

WATER TREATMENT PLANTS

The second field project carried out in the 1920's was a survey of the performance of representative municipal water treatment plants located

in 31 cities on the Ohio and other rivers of the midwestern and eastern States, and along the Great Lakes between Buffalo and East Chicago. The purpose of this study was primarily to establish, if possible, the limiting safe degree of raw water pollution which would permit the average well-designed and well-operated water filtration plant to deliver consistently an effluent meeting the bacterial requirements of accepted drinking water standards. In order to obtain comparable laboratory data, visits were made to each plant by Messrs. Streeter and Butterfield at different times, and a careful check of methods followed was carried out, after having given to each laboratory worker a set of instructions as to standardizing his methods in the interests of uniformity. An added feature of this study was the construction and operation of a fully equipped larger scale experimental water filtration plant of modern design at the Cincinnati station. The purpose of this experimental plant was to check the field observations under conditions subject to wide variation and careful laboratory control. The results of this study, published in a series of reports by Harold W. Streeter, Frederic J. Moss, and Charles T. Wright of the Cincinnati staff, established the basis for raw water standards which have remained in active use by the various State departments of health up to the present time (1950).

NEW STUDIES UNDERTAKEN

In the field of laboratory research, the period of 1920-1930 was marked by the starting of two important series of studies, one dealing with the experimental evaluation of natural purification phenomena in streams, and the other with some of the more fundamental aspects of sewage treatment methods and their laboratory control. The results of the first-named study were published in a series of 10 reports bearing the general title, "Experimental Studies of Natural Purification in Polluted Waters," and those of the second-named study, in a series of 17 reports under the general title, "Studies of Sewage Purification." These studies, carried out jointly at first by Butterfield, Purdy, and Theriault, and later participated in by Chemists Clarence C. Ruchhoft, Paul D. McNamee, Oliver R. Placak, Bateriologist Elsie Wattie, and Biologist

James B. Lackey, were continued at intervals up to the early 1940's and have covered a wide range of problems in their respective fields.

Mention should be made at this point of an important contribution by Chemist Emery J. Theriault in 1927 entitled, "The Oxygen Demand of Polluted Waters." In this monograph Mr. Theriault reviewed all previous work on the subject, both here and abroad, and presented the results of his own studies in the laboratory, covering a period of several years, and marked by the most detailed and painstaking work on the fundamental nature of the biochemical reactions involved in the well-known biochemical oxygen demand test now widely used in sewage treatment and stream sanitation.

During the years 1930-1931, a resurvey of pollution and natural purification was carried out in the mid-section of the Ohio River under the direction of Mr. Harry R. Crohurst. This survey, the purpose of which was to show the effects of complete impoundment of the river on its sanitary condition during and following periods of low water, occurred during a year of extreme drought, when the lowest stream flows of record were observed. It thus established a record of conditions for future reference which was ideal for its purpose.

FURTHER POLLUTION STUDIES

Other notable research projects carried out during the period of 1930-1939 included a survey of the pollution and natural purification of the Scioto River, begun in February 1937 and completed in July 1939. The main purpose of this survey was to evaluate the degree of improvement in the sanitary condition of the river resulting from the construction and operation of a new complete sewage treatment plant at Columbus, Ohio, which is located at the confluence of the Olentangy and Scioto rivers and discharges its treated sewage into the latter stream. In 1937 a series of observations covering a period of 10 months before the new plant was completed established a record of river conditions prior to the operation of the new plant, but while the stream was receiving the effluent of the old plant. During the following eight months, sewage was treated by the new plant with plain sedimentation only, resulting in more intensive pollution than during the first period. A year's observations during a period ending in July 1939, were obtained after the full

treatment had been instituted at the new plant, including activated sludge treatment. Difficulties with the sludge concentrating mechanism developed, however, necessitating the occasional discharge of sludge into the river; hence, it was not possible to measure the full effect of efficient operation of the plant on the river. Stream observations were discontinued when it became apparent that this operating difficulty would require some time to remedy, and further work was planned for some future time when conditions were more favorable.

The period of 1930-1939 was marked by the virtual completion of the two series of research projects on experimental studies of natural purification phenomena and of sewage treatment processes, and also by a very active program of publication of papers and reports on the results of studies completed during the past several years. This program resulted in the publication of some 40 official reports, including three public health bulletins, and 84 papers in professional journals, making a total of 124 publications dealing with the work at the Cincinnati station during this decade.

Under authority of the Rivers and Harbors Act approved August 26, 1937, the Public Health Service was requested to collaborate with the U. S. Corps of Engineers in a comprehensive survey of stream pollution throughout the entire Ohio River Basin. The facilities and personnel of the Stream Pollution Investigations Station at Cincinnati were augmented to carry out this program, and a staff of 58 technical and clerical workers was assembled and trained at the station. This staff maintained close contact with the Office of Stream Sanitation under Mr. Crohurst who, with a staff of 38 engineers and other workers, undertook a comprehensive sanitary survey of sources of pollution throughout the Basin, the assembly and analysis of hydrometric data collected by the Corps of Engineers, and the preparation of the final report of the survey, which was published in 1944 in three volumes as House Document No. 299, 78th Congress, First Session. The two volumes constituting the Public Health Service's contribution to this report numbered 1,368 pages, including numerous tables and charts.

Active work on the stream examinations was begun early in 1939, in a program planned originally to require three years but later revised

so as to be completed in two years. Using a large floating laboratory and three mobile units, together with the main laboratory at Cincinnati, a total of more than 71,000 water samples were examined and some 131,000 tests made, covering the entire area of 204,000 square miles of the Ohio watershed. The Office of Stream Sanitation, working from 11 field stations, surveyed some 3,700 municipalities and 1,800 industrial plants producing liquid wastes. This monumental task was completed on schedule in 1941, though some four years were required in order to complete the final report. When finished, the survey represented the largest undertaking of its kind ever carried out in this country or abroad, and it established a firm technical basis for a complete program of stream sanitation for the Ohio River and its tributaries, including estimated costs of corrective measures necessary to restore streams of the entire Basin to meet desirable standards of quality for various use requirements.

WORLD WAR II

With the entry of the United States into World War II, the working program of the Cincinnati station underwent a drastic revision. All activities not concerned with the war effort were sharply discontinued, and the work of the staff was directed, first to the more immediate problems of civilian defense, and later to active collaboration with the Army and Navy on special matters of water sanitation and sewage treatment connected with military operations. The station participated actively in training courses set up for air raid defense, specializing on the problems of war gases, their detection in water and foods, and measures for alleviating their effects on these media. The general problem of liquid wastes from munitions plants also required attention, as little was known of their possible effects on streams or of proper methods for their treatment and disposal. In this connection, surveys were conducted in the field of the volumes and composition of wastes from the various plants manufacturing different types of explosives, and much experimental work was carried out, both in the field and at Cincinnati, on various practicable methods of treatment and disposal for some of the more toxic wastes. Bio-assay methods for evaluating the toxicity

of different wastes were developed in the laboratory. The Cincinnati station cooperated with the Savannah Malaria Control Research Laboratory of the Service in studying the effects of DDT on aquatic life and natural bacterial flora.

Another important problem in which the laboratory at Cincinnati collaborated with the Army was that of water disinfection, both at the Army posts and in connection with field military operations. Field testing kits were developed and tested, several different types of field equipment for chlorinating and dechlorinating water with troop operations in progress were investigated, and an intensive and comprehensive laboratory study was carried out on the bactericidal effects of free chlorine and chloramines at different residual levels. The results of this study, made immediately available to both Army and Navy, not only guided those agencies in obtaining the most effective and economical use of chlorine for water disinfection, but also established a scientific basis for municipal water chlorination practice after the war. The most important development from these studies was in showing conclusively the great superiority of free chlorine as a bactericidal agent, as compared with chloramines, and the marked lethality of extremely small residuals of free chlorine to bacteria of the enteric pathogenic types. Definite relations were established between chlorine residual concentrations and the times of obtaining a complete killing action. In the chemical laboratory, a practical field test for differentiating between free chlorine and chloramine was developed by Chemist W. Allen Moore. The successful outcome of this research project was due largely to the work of Mr. Butterfield and Miss Elsie Wattie, and to the collaboration of the chemical staff under Mr. Ruchhoft's direction.

Other war-time research work at the Cincinnati station which contributed directly to the military effort included field studies of small-scale sewage treatment plants at several Army posts, by Mr. Ruchhoft and his staff.

In connection with emergency health and sanitation activities of the Service, an extensive program of mobile laboratory operations was carried out under the supervision of Sanitary Engineer Russell S. Smith in nine of the District areas. This work included examinations of the quality

of water and milk supplies and restaurant sanitation in local communities, and collaboration with the State and local health authorities in dealing with water pollution problems. Along the seacoast, surveys were made of shellfish areas and bathing areas located in proximity to Navy training and other stations. At the height of its operations, nine mobile laboratory units, each staffed with a chemist-bacteriologist and assistants, were in the field.

The post-war program of the Cincinnati station was broadened in 1944 when the station became a unit of the new Sanitary Engineering Division of the Service. Following the transfer of Mr. Hoskins to Washington in July 1940 and during the early days of the war, the station had been in charge of Dr. Herman E. Hasseltine, who was succeeded in April 1942 by Mr. Streeter on the occasion of Doctor Hasseltine's transfer to other duty. With this administrative change, the Cincinnati station assumed a new name of Water and Sanitation Investigations, with a correspondingly wider field of research activities. It thus became the center of such activities for the new Sanitary Engineering Division, though emphasis still remained on problems of water sanitation and wastes disposal associated with the correction of waterways pollution.

Among the major projects undertaken at this time was a study of sewage and industrial wastes pollution of the international boundary waters between Canada and the United States. This study originated through a request by the International Joint Commission, and it involved a cooperative survey with the Canadian public health authorities designed to ascertain the existing status of pollution of the boundary waters, the extent to which the waters on either side of the boundary were being polluted by wastes from the other side, and the specific recommendations which could be made jointly by the two parties to the Commission for correction of the situation. A laboratory was established by the Cincinnati station at Detroit where the filtration plant officials kindly loaned the required space. Field operations were begun in the section extending from the upper St. Clair River to the mouth of the Detroit River and later were extended to the Sault Ste. Marie, connecting Lakes Superior and Huron. After this portion of the survey had been completed, activities were transferred to the Niagara River section, with headquarters at Buffalo, New York.

Other water pollution and allied activities initiated in the field during the immediate post-war period included: (1) Stream pollution surveys in the Kansas and North Platte rivers; (2) a field and experimental study of household sewage disposal systems; (3) a bacteriological-epidemiological study of bathing beach pollution along the shore of Lake Michigan in the Chicago area, later extended to beaches on the Ohio River and Long Island Sound; and (4) studies of the efficiency of small sewage treatment plants.

In the laboratory, research projects included: (1) A study of indicator organisms in sewage and polluted waters; (2) a study of variations in the rate of biochemical oxygen demand reactions in the well-known biochemical oxygen-demand test; (3) systematic comparative studies of various methods for the chemical analysis of sewage and polluted stream waters; (4) studies of tastes and odors in certain types of industrial wastes and in stream waters contaminated by such wastes; (5) development of bio-assay methods for testing the effects of toxic water pollutants on fish life; and (6) extension of previous studies of the bactericidal effects of free chlorine and chloramines. Practically all of these projects involved coordinated staff work, with careful planning and organization. Some of them have been continued up to the present (1950), notably the studies of household sewage disposal and of bathing beach pollution.

A major continuing activity of the Cincinnati station closely allied with the stream pollution investigations arose from a widespread desire by the State departments of health for a general clearinghouse of information on public and institutional sewerage and water supply systems in various communities throughout the continental United States. In 1939 this survey was begun at the station with a view to utilizing the population figures resulting from the 1940 census. Following the initial compilation of data as of 1940, supplements were issued for 1941, 1943, and 1944. Beginning in 1943, it was extended to include data for untreated water supplies. At present (1950), detailed information, constantly brought up to date, has been collected and published for these community facilities in incorporated places of over 100 population and in some unincorporated places of less than 500 population. The project has been essentially a collaborative one, in which all the State departments of health, through their sanitary engineering divisions, have ac-

tively participated. It was originally organized by Sanitary Engineer Vernon G. MacKenzie and subsequently came under the direction of Sanitary Engineers Samuel R. Weibel, Russell S. Smith, and John R. Thoman in the order named.

In a history as long as that of stream pollution activities by the Service, it would not be practicable within the limited scope of this brief summary to include the names of all of those individuals who have contributed to various field and laboratory projects. Among those not mentioned previously but whose work should be especially noted up to the year 1948 are the following: Sanitary Engineer Robert W. Kehr, whose scientific contributions were outstanding and whose untimely death in line of military duty was a severe blow to the Service; Drs. Ralph E. Wheeler and Filip C. Forsbeck, who carried out a series of exhaustive epidemiological studies of waterborne disease in connection with the Ohio River Pollution Survey of 1939-1940; Sanitary Engineers Maurice LeBosquet, Jr., and Richard L. Woodward, who were largely responsible for the preparation of the final report of the Ohio River Pollution Survey, and the former of whom has had general direction of the International Boundary Waters Survey and other similar field activities during the post-war period; Biologist Floyd J. Brinley, who carried out almost singlehandedly a comprehensive biological survey of the Ohio River and its tributaries in 1939-1940; Sanitary Engineer Charles T. Carnahan, who has made several noteworthy contributions in connection with experimental studies of natural stream purification with the Ohio River Pollution Survey, and recently the North Platte River investigation; Sanitary Engineers Frank E. DeMartini and Albert H. Stevenson, who in succession have served as Executive Officers at the Cincinnati station and also have had an active part in its scientific work in the sanitary engineering field; and Sanitary Engineers Hayse H. Black and Ralph C. Palange, who successively were in immediate charge of the International Boundary Waters Survey.

ENVIRONMENTAL HEALTH CENTER, CINCINNATI, OHIO

In the year 1948, coincidentally with the retirement of Mr. Hoskins and Mr. Streeter, the former as Chief of the Sanitary Engineering Division and the latter as officer in charge at Cincinnati, a general reorgani-

zation of stream pollution activities of the Service occurred. This change came about partly as the result of the passage of Public Law 845, the Stream Pollution Control Act, which broadened and extended the functions of the Service in this field. The Cincinnati station was given divisional status, its name was changed to Environmental Health Center, and its functions and activities were broadened correspondingly. Mr. Vernon G. MacKenzie was appointed as officer in charge of the Center, succeeding Mr. Streeter, on the latter's retirement. The activities of the Center were reorganized under three main branches: (1) research and development, under Mr. Butterfield's direction; (2) surveys and investigations, under Mr. LeBosquet; and (3) training activities, under Mr. Ernest P. Dubuque, a sanitary engineer, (a) radiological health, and (b) sanitation. Important sections of research and development are the Milk and Food Sanitation laboratory, under the immediate charge of Bacteriologist Luther A. Black, and the Shellfish Sanitation laboratory at Woods Hole, Massachusetts, directed by Pharmacist Cornelius B. Kelly. Enlarged working facilities were provided by the rental of more space and the conversion of the old headquarters building into a physical and chemical laboratory.

The functions of the new Center, briefly stated, are to: (1) Conduct studies pertaining to environmental sanitation, including bacteriology, chemistry, biology, engineering, and other pertinent technical fields; (2) develop new methods and procedures in the field of environmental health; (3) provide training facilities and conduct training operations for health personnel in the operating procedures of environmental sanitation; (4) make available to Service Headquarters and the Regional offices, specialized assistance for the review of State and local plans and programs; (5) provide the Regional offices, upon request, specialized personnel for technical assistance; (6) make available the results of research and investigations and other operations of the Center; and (7) provide consultation service through Regional offices to Federal, State, and local agencies in methods and procedures in environmental sanitation.

With the increased funds and personnel, and enlarged working facilities now available to the new Center, the work of the Service in stream pollution investigations and their allied fields of pollution control will

doubtless go forward on a broadening front, with the ultimate goal of stimulating and supporting a nation-wide stream and lake cleaning program now getting under way in the several States. It is pertinent to note in this connection that the present well-established position of the Service in this field owes much to the fundamental work accomplished by the pioneer group of field and laboratory workers originally assembled and led by Doctors Cumming and Frost, and Professor Phelps, nearly 40 years ago, when this work had its inception. Happily, most of this original group have lived to witness the results of their basic contributions to stream sanitation during the early years of their labors.

Shellfish Sanitation

Drs. Leslie L. Lumsden and John F. Anderson of the Service in a report on the prevalence of typhoid fever in the District of Columbia pointed out that raw oysters played a considerable part in the spread of typhoid during the winter of 1908-1909. During the summer of 1914, Dr. Richard H. Creel investigated oyster growing beds at Biloxi and Gulfport, Mississippi, and made certain recommendations concerning elimination of sewage pollution and the restriction of oysters from polluted areas.

Between 1913 and 1916, Dr. Hugh S. Cumming and a group of other officers of the Public Health Service carried on the first widespread field investigations of the sanitary quality of shellfish growing areas made in the United States. The initial period of this work covered the waters of the Potomac River with special attention being given to the safety of oysters grown in the lower portion of the stream. The Service steamer *Bratton* was used as a base of operations, with a temporary laboratory under the direction of Dr. Warren F. Draper in operation at Colonial Beach, Virginia. Sanitary Engineer Harry P. Letton, Sanitary Chemist William F. Wells, Sanitary Bacteriologist Henry V. Stewart, and Biologist William C. Purdy were other members of this staff. Following the completion of this study, Doctor Cumming took on the responsibility for extensive investigation of the tidal waters of Maryland and Virginia. Experience was being accumulated during these surveys so that the report contains a great many specific recommendations based on care-

fully collected, though limited, information. It was during this period that the Service first moved to fill the gaps in basic knowledge of the bacteriology of shellfish. Mr. Wells and Mr. Stewart were detached from the *Bratton* in September 1914 to do experimental work on the bacteriology of oysters in a laboratory set up at the U. S. Quarantine Station on Fisherman's Island, near Norfolk, Virginia. Significant studies were made on hibernation and on the artificial purification of oysters. During 1915 and 1916 Doctor Cumming turned his attention to certain tidal waters of Delaware, New Jersey, and New York. The increased competence of the Public Health Service in the field of shellfish studies of this nature was recognized by now, this period being devoted in part to restudying certain areas where there had been lack of agreement by authorities of New Jersey, New York, and the Bureau of Chemistry (now the Food and Drug Administration). Dr. Clifford E. Waller and Sanitary Engineer Charles A. Haskins joined the field staff for this work. The significance of these extensive field studies under Doctor Cumming undoubtedly can be measured best in terms of the speed with which the shellfish industry and the State health departments turned to the Public Health Service when real shellfish difficulties appeared in 1924.

This increased attention on shellfish sanitation matters by the Service was reflected indirectly in a number of ways through the States. The first Annual Conference of State Sanitary Engineers, meeting with representatives of the Public Health Service in 1920, considered the sanitary protection of shellfish in some detail, though there was still no request for any sort of formal interstate cooperation.

During the fall and winter of 1924-1925, there occurred a series of typhoid fever outbreaks in New York, Washington, Chicago, and a number of other cities of the United States. Preliminary epidemiological investigations soon showed that raw oysters from New York were involved. Surgeon General Cumming caused a complete investigation of these outbreaks to be made by officers of the Service. Drs. Leslie L. Lumsden, Herman E. Hasseltine, James P. Leake, and Milton V. Veldee reported on this in a study which has become a basic contribution to the knowledge of shellfish-borne disease. At a conference called by Surgeon General Cumming on February 19, 1925, representatives of the States and the shellfish industry, whose business was seriously affected by the

adverse publicity regarding this disease outbreak requested the Public Health Service to organize a system of sanitary control of the shellfish industry. Certain basic principles were laid down by this group, agreed to by representatives of the Bureau of Fisheries (now the Fish and Wildlife Service) and of the Bureau of Chemistry (now the Food and Drug Administration), and a committee appointed by Surgeon General Cumming to draw up specific recommendations for applying these principles. Dr. Wade H. Frost was the Public Health Service representative and chairman of this committee. Its report with two supplements is still the fundamental guide for Public Health Service participation in shellfish work, though added basic knowledge has changed certain details.

Soon after assuming responsibility for guiding the sanitary control of the shellfish industry, the Service announced that it considered the primary responsibility to belong to the States and that its own functions would consist chiefly of a review of State operations and the dissemination of its findings to receiving States and others concerned. Seven field offices of the Public Health Service were set up to handle this review work and to assist the States through cooperative surveys and investigations. A floating laboratory, the *Shearwater,* was provided for special field studies of growing areas. Many of the shellfish-growing waters of the Atlantic and Gulf coasts were first studied from this launch. In addition, a laboratory for research into basic problems of shellfish bacteriology was set up at Craney Island near Norfolk, Virginia. Drs. Hasseltine and Waller and Sanitary Engineer Ralph E. Tarbett were successively in charge of this laboratory, which was discontinued in 1928.

During the years 1926-1928, the State shellfish control agencies were actively engaged in improving conditions of shellfish production and handling. Increased interest and concern are to be noted in the Conference of State Sanitary Engineers and the American Public Health Association, both of which groups organized shellfish committees having Public Health Service representation. Gradually, however, unsolved problems, both technical and operational, began to cloud this arrangement. In June 1928 the need to conserve staff made necessary the absorption of the shellfish districts by the older Interstate Sanitary Districts of the Service. Similar curtailment of effort was taking place in

most of the States also during this period, resulting in a deterioration of the over-all shellfish sanitation control program.

One of the basic difficulties in applying the review and endorsement principle to the State programs had been the lack of specific detailed requirements for the States to meet, chiefly because the basic knowledge on which such requirements might be prepared was not available. By 1937, however, such specifications could be, and were prepared. During the intervening years credit is due sanitary engineers Lawrence M. Fisher, Arthur P. Miller, Edmund C. Sullivan, and H. Norman Old, and Bacteriologist Chester T. Butterfield, who maintained the program despite various adverse circumstances. Mr. Fisher, in particular, through his many years of service as chairman of the American Public Health Association Shellfish Committee, did much to keep the Federal-State-Industry cooperation functioning. During this period, also, some important field surveys were made by the Public Health Service in cooperation with the States. One was the 1934 study of the Hampton Roads area of Virginia.

In 1940 the Service once again undertook to investigate some of the basic problems of shellfish bacteriology in a laboratory organized at Craney Island in cooperation with the Virginia State Department of Health. Dr. Leslie A. Sandholzer was in charge of these activities, which had to be discontinued early in 1942 because of the war. In 1941 an especially significant report was prepared by the Public Health Service in cooperation with the shellfish control authorities of New York, New Jersey, and the health department of New York City. This study covered the public health aspects of using hard clams from Raritan Bay of New York and New Jersey. Some of the findings on bacteriological standards for shellfish-growing water in this report have been extended to more general coverage.

By 1944 experience in applying minimum requirements had made possible the development of a more complete "Manual of Recommended Practice for the Sanitary Control of the Shellfish Industry," which was revised and given wider distribution in 1946. This date marked the beginning of a rather extended improvement in shellfish control activities in the United States. Release of personnel from wartime activities made it possible to provide for the first time a sanitary

engineer, Richard S. Green, to direct the development of the quality of shellfish control measures. Better correlation of activities of the Public Health Service personnel working on shellfish matters in the various sections of the country was possible and much closer contact with State activities resulted. An educational film was developed for use in this work. Provision was made in 1948 for an Advisory Committee to consider the research and other efforts of the Service on shellfish matters, and a laboratory for shellfish research set up at Woods Hole, Massachusetts. During this period relationships with Canadian officials interested in shellfish matters were developed further to the point where an international agreement on shellfish sanitation was consummated on April 30, 1948. Certain necessary changes were made in the Interstate Quarantine Regulations on shellfish quality and an important revision to the Federal Specifications on Shucked Oysters was made effective. Well trained personnel in both the Public Health Service and the State shellfish control agencies have continued to secure improvement in sanitary quality of shellfish produced in the United States.

Mental Hygiene

For many years the term mental hygiene was limited largely in application to what today are classified as the psychoses. The behavior of such patients more often leads to legal commitment and institutional segregation for the protection of both the patient and the community. It is this step that is implied by the term "insanity," a term which has no other meaning in medical terminology. In addition to the psychoses, it is recognized that there is an even larger field of mental illness in which the question of compulsory segregation of the patient or of "insanity" does not arise. This group comprise what is known as the "psychoneuroses."

The psychoses and the psychoneuroses do not complete the total disorders which are embraced in the concept of mental hygiene. To these must be added mental deficiency or feeble-mindedness, as it is more often called, and the epilepsies or convulsive disorders. A variable proportion of behavior problems now included under the heading of delinquency and crime, dependency and mendicancy, drug addiction, and

alcoholism command interest. But there is still an additional group of large size, consisting of affective behavior problems of children, of adolescents, and of older persons, not ordinarily included with the psychoneuroses, but which are the outcome of faulty habits and misunderstandings in dealing with environmental and interpersonal relationships.

These behavior problems, particularly among children and adolescents, are often related to failures, delinquency, and ineffectiveness in later life. These latter have no relation to the scapegoat "ill luck," but rather to hostility, intolerance, and prejudice that are the results of emotional misevaluations of incidents in their lives. These problems, too, may be the forerunner in the eventual development of a malignant mental disorder. Moreover the inordinate, exaggerated, and overzealous pressure of activity which characterizes some of these behavior problems may mask or compensate for feelings of personal inadequacy. Then, too, unaccountable variations in moods and in energy expenditure may be the analogue of future mental ill health. Such behavior problems may assume the configuration of physical disability and are characterized by somatic complaints of illness as figurative expressions of a retreat from difficult or humiliating emotional situations.

Modern medicine is also becoming increasingly aware that the symptoms and nature of illness are often related directly to the personal affairs of patients. These personal problems are often the precipitating or predisposing causes.

Because mental health is concerned with many diversified types of illness and disability, any plan which seeks to promote or safeguard the mental health of a given population must be coordinated with the work of other disciplines that seek to restore the sick, the weak, and the afflicted to health; to promote effective living for the disabled and place them in the way of strength and hope; to prevent sickness and disease; and to promote healthful, joyous living.

In the early part of the present century, very little was known about the occurrence of mental disorders. Knowledge was similarly lacking on the measures being taken by various communities to meet these problems. The concept of mental hygiene as an area of public health concern was almost non-existent.

EARLY MENTAL HEALTH EFFORT

The pioneer mental health field study by a Service officer was made in the spring of 1914 by Dr. Walter L. Treadway, then of the Ellis Island Immigration Station. The study was made in collaboration with the Russell Sage Foundation and the National Committee for Mental Hygiene, and was one phase of a broad general social survey being conducted at Springfield, Illinois. The object was to throw light upon the efficacy of public and private agencies ministering to local social needs in a typical American community.

MENTAL HYGIENE FIELD STUDIES: 1915-1919

The Springfield report appeared in the autumn of 1914, when it came to the attention of Surgeon General Rupert Blue, who was impressed with the need for further investigations in mental hygiene by the Public Health Service. In 1915, Doctor Treadway was assigned to duty with the Office of Field Studies of School and Mental Hygiene, where he worked with Dr. Taliaferro Clark, medical officer in charge of that field station, on a series of studies on school children.

The field studies made by the Office of School and Mental Hygiene embraced not only sanitation and physical health but also the mental health of the school child. They also included an evaluation of State and local policies concerned with dependency, crime, delinquency, and other socially adverse behavior problems related to mental illness and mental defect. The investigations embraced samplings of almshouse populations and other institutions ministering to the indoor relief needs of indigent persons, samplings of the populations of public and private institutions caring for incorrigibles and for those who had committed offenses against the law, a sampling of school populations, and surveys of the policies of State and local education systems concerning methods for early detection of mental disease or defects and the measures employed for their amelioration. Included also was a sampling of unmarried mothers and incorrigible young women quarantined in institutions because of active venereal disease. Juvenile court methods and procedures were also studied by rendering psychiatric services for the Juvenile Court of the District of Columbia.

The segments of the population studied were of varying economic and social status, rural, urban, and suburban. Areas touched heavily by foreign immigration were included, as were areas populated chiefly by native-born stock. Samplings were also made of those populations having a high endemic index of malaria and of nutritional diseases.

RENEWAL OF MENTAL HEALTH FIELD STUDIES

In the late summer of 1922 an Office for Field Studies of Mental Hygiene was established with headquarters at the Department of Preventive Medicine, Harvard Medical School, with Doctor Treadway as the Medical Officer in Charge.

During the three year period, 1922-25, a special study was made of the ways in which the migration of people to America had influenced the mental health of our population and what effect it had upon the development of measures for the amelioration of mental illness. Studies of a social casework type were also made during this period. These dealt with an analysis of family interpersonal relationships between foreign-born parents and native-born offspring and the effects that clashes between old world and American customs and standards had upon family harmony or led to incorrigibility among native-born children of foreign-born parents.

THE DIVISION OF MENTAL HYGIENE

The Division of Mental Hygiene was established as part of the Public Health Service in 1930, Doctor Treadway heading its activities. By 1936 the Division had crystallized a set of fundamental principles as a foundation upon which future activities would rest. These were:

1. Furtherance of the early recognition and prompt, adequate treatment of mentally ill persons.
2. Investigations into the nature and underlying causes of mental and emotional disorders.
3. The training of personnel for work in the mental hygiene field.
4. The development of preventive measures that would tend to reduce the problem of mental illness.
5. Efforts to find more satisfactory solutions for the economic problems associated with mental illness.
6. Measures for uprooting community sources of mental invalidism, disease, and defect.

Drs. Lieuen M. Rogers and Seymour D. Vestermark, assisted by Psychologist C. C. Limberg, all of the Service, with some assistance from the Commonwealth Fund, carried on in Lexington, Kentucky, from 1935 to 1940 a field study in epidemiology of mental disorders.

Recognizing the need for developing mental health programs within the framework of existing public health agencies, Dr. Lawrence Kolb, then in charge of the Mental Hygiene Division, in 1940 brought to Washington Dr. Victor H. Vogel to act as Mental Hygiene Consultant in developing programs in the States. Doctor Vogel, an officer with psychiatric training, had just completed a postgraduate course in public health and devoted his attention mainly to consulting with State health departments on the development of State mental hygiene activities. There was considerable interest, but progress was slow since there was no financial assistance earmarked for mental health programs. This mental hygiene consultant service was discontinued during the war. In the late 1930's, from time to time, several Service officers beginning with Dr. Grover A. Kempf, in cooperation with the National Committee for Mental Hygiene, performed surveys of State mental hospitals, upon request of the Governors concerned, as a means of bringing about improved care for mental patients. During this period Doctor Kempf also prepared a useful compendium of State commitment laws.

With the passage of the National Mental Health Act in 1946, interest and activities in this field have greatly increased. The important problem of mental health is being attacked through three principle programs: research, training of professional workers, and aid to state and local community programs. Service officers trained in psychiatry have been assigned to Regional offices to act as consultants to the States in developing their mental hygiene programs. From 1946 until 1949 this work was carried on by the Division of Mental Hygiene. In 1949 the Division of Mental Hygiene was abolished and the National Institute of Mental Health was established as a unit in the National Institutes of Health. Under the leadership of Dr. Robert H. Felix and his staff this important activity is making steady progress.

County Health Administration Field Studies, Edgecombe County, North Carolina

Following the studies of Dr. Leslie L. Lumsden on typhoid fever in Yakima County, Washington, in 1911 and the resultant appointment of a county health officer there, surveys were conducted under Doctor Lumsden's direction of rural health conditions in several counties. Such surveys were first conducted upon an invitation from the State and local health authorities in Dorchester County, Maryland, and Bedford County, Indiana, in 1914. Under the guidance of Doctor Lumsden, a group of Service officers was sent to each county where a survey was planned. The work was conducted during the spring and summer months. Working closely with the governing authorities of the counties and towns concerned, a house-to-house canvass was made, pointing out sanitary defects and giving advice as to how these defects should be corrected. This advice usually centered around the safe disposal of human wastes, the protection of water supplies, and screening against insects. The usual recommendations for each home were the construction of a sanitary privy, the safeguarding of the well to prevent surface drainage, and the screening of the home to prevent the entrance of disease-bearing insects, particularly flies and mosquitoes.

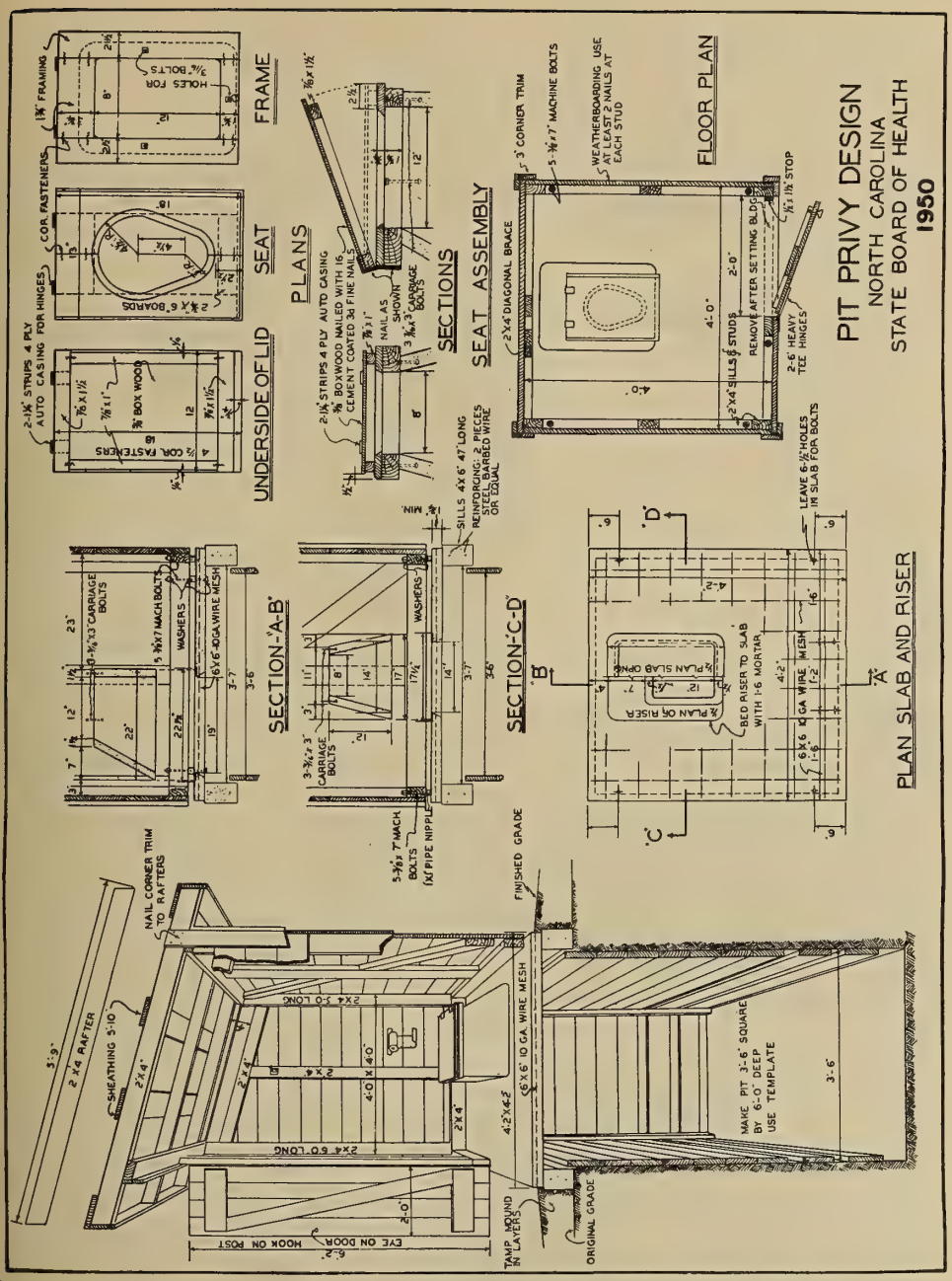
This program was carried on during the summers of 1914 through 1916. It became evident that as a means of sampling the problem these rural sanitation surveys were useful but they had no continuing value. It was obvious that some definite information would be required as to the type of county health unit needed in rural health administration, the number and kind of personnel, and what should constitute the responsibilities, duties, and scope of the work. Dr. Knox E. Miller was selected to undertake such a study, and arrangements were worked out with Dr. Watson S. Rankin, State Health Officer of North Carolina, whereby Edgecombe County in that State was designated as the site of a cooperative project for study and demonstration of the principles of county units and local health administration. The experience of Doctor Miller in Edgecombe County demonstrated that in order to attempt rural health work certain minimum requirements must be provided:

(1) Sufficient funds to maintain an effective unit; (2) qualified professional staff to carry on the program; and (3) office space, furniture, records, clerical staff, transportation for official purposes.

During the course of the Edgecombe County experience, another pioneering enterprise of considerable interest was carried out. At that time, milk sanitation everywhere was in a chaotic state. World War I was in progress and the attention of the farmers was turned to raising cotton and tobacco, rather than producing milk. As a consequence, there was almost a milk famine in the town of Tarboro, North Carolina, and such milk as was available was of highly questionable sanitary quality. This was long before the days of the standard milk ordinance. In order to stimulate more milk production, it was necessary to relieve the producer of the overhead expenses of house-to-house delivery, collection, breakage, losses on accounts, and the like. The other objective was to assure safe milk. To meet these needs a plan was devised for establishing a municipal milk plant to receive milk in bulk from farmers. The milk would be pasteurized, bottled, and delivered to the customers. The problem was presented to the City Council who agreed to undertake the experiment. A plant was installed in 1918. The success of this plant in fulfilling its purpose exceeded all expectations. The plant has become a permanent fixture and has stood the test of a Supreme Court decision which declared it to be a public utility in the same sense as a municipal water supply. It has been shown over a period of 32 years that this is a practical approach to the problem of affording a safe and sufficient milk supply in a small city. With or without the standard milk ordinance, this plan is capable of serving other communities with success of equal magnitude, as it did in Tarboro.

In the development of rural sanitation the mode of construction of sanitary privies early became an important problem. The privy consisting of a box and a removable bucket was the approved type in common use. Doctor Lumsden was a man of very great determination. During his studies in certain outbreaks of typhoid fever he became impressed with the danger of the use of pit privies, particularly in limestone soil. This made him unalterably opposed to any type of pit privy.

On the other hand, during the rural sanitation work that Dr. Knox E. Miller had conducted in Kansas and in Iowa in 1915, he was im-



(Courtesy of the North Carolina State Board of Health)

Current design of sanitary pit privy approved by North Carolina State Board of Health. This is based upon studies by the Public Health Service and modifications that have evolved from many sources through the years.

(Courtesy of Dr. Calvin C. Applewhite)

Sanitary Pit Privy, 1950

pressed with the practicability of a privy built over a pit. He noticed that there also seemed to be a correlation between this and the fact that typhoid fever was not common in those rural areas. He therefore reached the conclusion that using a pit and adding seat covers to exclude flies would be a long step toward a practical solution of the problem of privy construction.

In the winter of 1915, Doctor Miller proposed to Doctor Lumsden that under appropriate soil conditions the pit privy be utilized instead of the box and can. Doctor Miller recalls that for suggesting such diabolical heresy, he barely escaped mayhem for straying from the strict path of orthodoxy.

Dr. Watson S. Rankin, State Health Officer in North Carolina, secured the passage of a statewide privy law during the 1918 session of the North Carolina legislature. This required every residence within 300 yards of another residence to install a sanitary method of excreta disposal by public or private sewer system or a lawful privy. The problem then was to define a lawful privy.

In search for an answer as to what should be recognized as fulfilling the requirements of the law, Doctor Rankin and Doctor Lumsden went to Edgecombe County where Doctor Lumsden and Doctor Miller conducted an all-day argument on the merits of the pit privy versus the box and can. Eventually, Doctor Lumsden weakened to the point of admitting that from a practical standpoint the pit privy had the advantage. Thus, the pit privy qualified for approval under the North Carolina law. Subsequent events proved the almost universal acceptance of the pit type, although there were six other approved types including the box and can. It should be recorded that Doctor Lumsden eventually became one of the most ardent advocates of the pit privy in preference to any other type.

The pit privy that finally emerged was screened, ventilated, and provided with cover lids. The progress of rural health work was greatly advanced during the 1930's through the privy-building programs of the Civil Works Administration and the Works Progress Administration. The construction and the utilization of thousands of sanitary privies throughout the rural areas of this country were the gratifying results of these efforts.

Studies of Administrative Practices in Public Health

ORGANIZATION AND ADMINISTRATION OF STATE AND LOCAL HEALTH SERVICES

From the beginning of their development, State and local health departments have been characterized by many different patterns of organizational structure, methods of administration, and program content. Thus, very early there arose the necessity of examining the appropriateness of organization and administration for the problems to which official health agencies would address themselves. Such investigations not only provide information regarding the practices of municipal, county, and State health departments, but also serve as a means of appraising the effectiveness and economy of particular types of operations under varying circumstances.

The Public Health Service began its survey of State and local public health administration with a study of health organization in Maryland in 1913. This study, requested by the State, was a natural outgrowth of the compilation of health laws and regulations of the several States which the Service had been engaged in—at the request of the Conference of State and Provincial Boards of Health—since 1910. This study was the first of a series made by Dr. Carroll Fox. Subsequent to publication of Doctor Fox's report, many States requested similar administrative surveys. Between 1914 and 1917, individual surveys were made in a dozen States and a score of cities by Dr. Carroll Fox, Dr. John W. Kerr, Dr. Taliaferro Clark, Dr. James C. Perry, and Dr. George B. Young.

In 1917, Dr. Knox E. Miller was assigned to Edgecombe County, North Carolina, for the purpose of working out principles of public health organization and administration which might be adopted in county or municipal public health work. This study was the first of many surveys of varying nature which Doctor Miller made throughout his Service career. While much of his work was in the field of rural sanitation, he had an excellent background and broad experience in general public health administration. His work of this character was climaxed by the Chicago-Cook County survey made in 1947.

Surveys and studies undertaken by the Public Health Service during the 1910-1920 decade were individual investigations made upon request of the respective State and local health authorities. No extensive comparative studies were attempted in this period.

In 1920, the Committee on Municipal Health Department Practice (forerunner of the Committee on Administrative Practice) of the American Public Health Association had become interested in a comparative study of municipal health departments. With the cooperation and active participation of the Metropolitan Life Insurance Company and the United States Public Health Service, this Committee arranged for the survey of the health departments of 83 of the largest cities of the United States. More than a fourth of this group of surveys were made by Public Health Service officers, Dr. Lewis R. Thompson being responsible for by far the largest number. A detailed report was made, and a plan, based on the best existing knowledge, was prepared for an ideal health department for a city of 100,000 population. This work proved so useful that several years later the Office of Administrative Health Practice was established by the Service to carry on activity of this kind on a continuing basis for the purpose of providing consultation service to local health officers. The Office of Administrative Health Practice was directed by Dr. Paul Preble, with headquarters in Baltimore at the Johns Hopkins School of Hygiene and Public Health. Under Doctor Preble's leadership, the 1920 information on municipal health department practice not only was brought up to date for the cities originally surveyed, but were extended to 17 more. Fifty medical officers and sanitary engineers were assigned to the field work for this expanded study. Deficiencies and inconsistencies of the health services of the large cities of the United States were forcibly brought out in the report of the survey. Since that time the Public Health Service has taken an increasingly prominent part in surveys and studies of the machinery of official health administration.

The absence of standards and clear-cut definitions and the gap between known principles of sound administration and their application were matters of grave concern to Doctor Preble and his associates. Consequently, studies of State and local health services undertaken by the Office of Administrative Health Practice, until it was discontinued in 1929, more and more were slanted away from the spot survey and

toward the more extended and analytical type of study resulting in changes of procedure.

The health administration demonstrations of Dr. Robert Olesen in North Dakota and of Dr. Richard B. Norment and Dr. Charles V. Akin in Washington County, Maryland, both of which began in 1923, were further efforts of the Service to improve State and local health administration. However, it was not until the Office of Public Health Methods was established in the Public Health Service in 1931, to carry on and expand the work begun by the Office of Administrative Health Practice, that scientific research was applied to the field of administrative practice. Dr. Joseph W. Mountin, who headed the new Office of Public Health Methods, came with a background of practical experience in State and local health service, including several years of assignment with the remarkable group which at that time were associated with Vanderbilt University, Peabody College, the Tennessee State Health Department, and the Rutherford County Health Demonstration. He was convinced of the necessity for experimental work in the development and testing of new administrative methods and procedures.

The early studies conducted from 1913 to 1930 by both the Service and other agencies were of a broad organizational character, limited to the administrative experience and practical judgment of the individual surveyor. The approach selected by Doctor Mountin, beginning in 1931, was that of case studies devoted to particular situations and of follow-through under known conditions on changes in procedure suggested.

Therefore surveys of local health problems and community services during the 1930's included detailed analysis of selected operations in the programs of health agencies. From these studies it has been possible to evaluate administrative practice and to adapt and reshape public health practice to meet changing requirements. While these studies originated in the Office of Public Health Methods within the Division of Scientific Research, and later within the National Institute of Health, they were continued in the several divisions of the Bureau of State Services, as each division assumed responsibility for investigations related to its own function.

The morbidity studies of Edgar Sydenstricker and Selwyn D. Collins, statisticians, which highlighted health needs of the people, and the

studies of the Committee on the Cost of Medical Care, which emphasized need for reexamination of health programs, served as stepping stones to the case-study type of administrative research which the Office of Public Health Methods initiated. Similar studies have been continued and amplified by Mr. George St. J. Perrott and Dr. Selwyn D. Collins.

The studies conducted in Brunswick and Greensville Counties, Virginia; Forsyth County, North Carolina; Fairfax County, Virginia; and Montgomery County, Maryland; are examples of the work done by the Office of Public Health Methods in the field of local health administration. These studies were designed to relate the health needs of people living in rural areas to the manner in which county health departments operating under different plans of administration meet these problems.

The time and effort spent by health department workers in maintenance of records and preparation of reports was a problem of health administration to which the Committee on Records, Reports, and Administrative Practices of the Conference of State and Provincial Health Authorities of North America addressed itself in 1939. To study this problem, a full-time Field Consultant Staff was employed cooperatively for several years by the Commonwealth Fund, the Public Health Service, and the Children's Bureau. Dr. Joseph O. Dean, of the Service, was director of this Field Consultant Staff. The purpose of the staff was to aid State health departments in analyzing their record problems, to work toward the simplification of records, and to bring into focus the kind of information needed by local, State, and Federal agencies. Upon the termination of this cooperative study, work of a similar nature was continued by the Public Health Service on a demonstration basis, under Doctor Mountin's direction for a time, and later under the direction of Dr. Estella Ford Warner.

As establishment of county health departments gained momentum, there was considerable variation in the stability of their organization. An analysis was made of the organizational experience of the health departments in 811 counties during the period 1908-1934, in order to determine the factors which influenced growth and survival of organized health services.

A number of studies of State as well as local health administration has been made by the Public Health Service throughout the years. In collaboration with the Brookings Institution, as part of its general survey of State governments, studies of the organization and administration of State health and, in some instances, medical and hospital services were made in a number of States.

However, with the employment of a full-time field staff by the American Public Health Association for surveys of individual States, the Public Health Service, after 1940, began devoting less time to studies of individual departments and, as in the case of local health administration, turned its efforts to the more inclusive comparative studies of public health administration in a number of States. Ten years after Doctor Charles V. Chapin's study of State boards of health in 1915, at the request of the State and Provincial Health Authorities of North America, an exhaustive study of State health organization and administration was made in 1925 by the International Division of the Rockefeller Foundation. Since that time, the data have been brought completely up to date periodically, in order that they might retain their value. The Public Health Service was assigned full responsibility for the 1940 revision of this study. Because of the expansion of public health interest in new fields of activity both within the health department and within the programs of other official agencies, this study has been expanded to include the functions of all State agencies in so far as they touch upon health activities.

CONTENT OF STATE AND LOCAL PUBLIC HEALTH PROGRAMS

Studies of changes which need to be made in program content have also influenced the reshaping of public health practices to meet changing requirements. Two kinds of studies were made to determine the types of services most needed. The first was the usual observation and analysis of the variety and adequacy of services being rendered under natural conditions. The second was the setting up of demonstration projects designed to open new areas of activity. Recognition of the importance of initiating or expanding activities connected with industrial hygiene; venereal disease, tuberculosis, cancer, heart disease, and diabetes control; mental hygiene; prevention of dental caries; improvement of the

nutritional status of the general population; and water pollution control, grew out of such studies.

Currently, investigations are being made into the chronic diseases and other problems associated with the degenerative processes of aging; factors causing accidents, which rank high in the list of causes of death and diseases; newer and better methods of controlling insects and rodents; methods of controlling diseases of animals communicable to man; and ways of preventing water and atmospheric pollution. The nature of these investigations forecasts further adaptations in the content of public health programs.

GRANTS-IN-AID IN PUBLIC HEALTH ADMINISTRATION

Probably one of the strongest stimuli to expansion and improvement of State and local health services has been the device of Federal grants-in-aid. The Service has made several investigations of the influence of Federal health grants, with a slant toward the effect this pattern of operation might have on the public health programs of the future. Extensive research has been carried on in the development of methods and procedures for the most efficient administration of grants-in-aid for health purposes.

HEALTH FACILITIES

Since the official health department utilizes all other health facilities of a community, the availability and distribution of physicians, dentists, hospitals, voluntary health agencies, and any other organization which contributes in any appreciable way to the promotion or conservation of human health must be taken into consideration in an inclusive appraisal of administrative problems involved in the provision of adequate community health services.

The National Health Inventory included a census of hospitals and of out-patient departments of hospitals in all parts of the continental United States. Information was collected on the activities of all types of health agencies in 94 selected counties. This body of data yielded valuable facts concerning variations in the form and services of public health organizations.

HEALTH DEPARTMENT AND HOSPITAL SERVICE AREAS

The importance of developing a strong interrelationship between health departments and hospitals was recognized by the Public Health Service. Growing out of the study of the need for small hospitals in rural areas, suggestions were developed as to how such hospitals, with slight adaptation, might also fulfill the functions of health centers. Further study of the problem led to preparation of a suggested "plan" for an integrated scheme of hospitals and related facilities to cover every section of the nation. Following passage in 1946 of the National Hospital Survey and Construction Act, each State hospital authority formulated its own plan of hospital distribution. While differing in detail from that proposed by the Service, attention to local problems characterized all State plans and other essential features were similar.

Investigations into this whole area of health department and hospital integration were climaxed by a study of the feasibility of developing local health districts in relation to hospital facilities. From this study it was concluded that counties might be combined in such manner that the district could be used alike for hospital development and public health administration.

MEDICAL AND DENTAL RESOURCES

Physical facilities without sufficient well-trained professional personnel for their staffing are only empty shells. Therefore, it was necessary to study the location and movement of physicians over a period of years to determine the factors which influenced their distribution throughout the country. It was found that high income levels are likely to be the dominant factor in determining where a physician establishes his practice. The presence of hospital facilities is another important consideration, and there is a pronounced tendency for physicians to concentrate in urban areas. Migration rates of physicians of different age levels were also studied, and suggestions were made regarding recruitment of young physicians to replace losses from the profession.

Similar studies have also been made of the distribution of, and need for, dental personnel. Dentist-population ratios in States and counties with varying socio-economic characteristics were analyzed and trends in availability established.

(From USPHS Records)

LEFT TO RIGHT: *S. R. McKay (Dental student), Dr. Francis E. Harrington, Dr. Calvin C. Applewhite, R. H. Collins (Medical student), Drs. Winfield K. Sharp, Jr., Quintard Taylor.*

Groups engaged in rural sanitation surveys wore field uniforms as a means of identification. This picture was made at Hillsboro, North Carolina, in 1915.

(Hessler, Washington, D. C.)

Dr. Joseph W. Mountin

HEALTH STUDIES IN FOREIGN COUNTRIES

As the influence of the United States in world affairs has extended beyond our national boundaries, assistance from the Public Health Service has been requested for health studies in other countries. While the first study of health administration outside the continental United States, an inclusive survey of the incidence of illness and provisions for public medical care in Puerto Rico, cannot be classified as "foreign," the situations encountered differed sufficiently from those found in the 48 States to make it worthy of mention. The extremely low income levels and conditions favorable to malaria, hookworm disease, and tuberculosis called for recommendations representing rather drastic changes in the pattern of organization and methods of operation which characterized their existing public health and medical care systems.

There has been considerable variation in the types and purposes of health studies of foreign countries. With the location of United States military installations in Liberia during World War II, our Government became extremely interested in the public health conditions there, particularly in the problems of environmental sanitation, including malaria control. The Public Health Service was charged with organization of a Health Mission to Liberia, designed to improve the public health status of that country. With encouraging cooperation, including considerable financial support, from the Liberian Government, this Mission has continued.

In the course of a detailed study of the whole field of public health and medical relief which was being made by the Government of India, representatives from the United States, England, Australia, and Soviet Russia were invited to visit that country to assist the Indian Health Survey and Development Committee (better known as the Bhore Committee) in its task of surveying existing conditions and organization and of making suggestions for future development.

As part of the reconstruction program for Japan after the close of World War II, the War Department requested that a Social Security Mission be sent to Japan to study the health and welfare structure existing there and to recommend changes in the medical and social insurance systems and in public health organization and administration.

Dr. Joseph W. Mountin represented the Public Health Service as a member of this mission. Inquiries into public health activities and medical services and facilities were extended to legal provisions, organization, coverage of existing services, and methods of administration. Recommendations were made as to how the current programs might be modified to operate more efficiently and more satisfactorily from the standpoint of benefits and population covered.

In 1949, the International Bank for Reconstruction and Development organized an Economic Mission to Colombia, South America. The study of capital requirements for governmental functions and services during the ensuing decade encompassed health needs along with needs for education, agricultural and industrial development, police protection, courts of justice, highways, and other governmental functions. On this mission also, Doctor Mountin was the Public Health Service officer who examined the health status of the country, relating the effect of the health of the general population to the country's productivity, and he outlined proposals for the most appropriate health organization, commensurate with available resources.

More recently, in connection with the transfer of Guam from naval to civilian authority, the Governor of that island requested a survey of public health activities there by an officer of the Public Health Service. Dr. Harold R. Sandstead was assigned to make this survey, which led to recommendations regarding the most practical methods for administering public health and hospital services and training medical and dental assistants under civilian administration.

Administrative research, like other types of scientific research, will continue into the future, shaping public health programs to come just as it has influenced those of the past.

Investigations and Treatment of Drug Addiction

The role of the Public Health Service in the field of drug addiction has been a dual one. The Service has operated two hospitals devoted to the treatment and rehabilitation of individuals addicted to morphine (or similar drugs), cocaine, and marihuana, and has also carried on an extensive program of research concerning the incidence, trends, causes, mechanisms, methods of treatment, and prevention of drug addiction.

EARLY WORK

After the Armistice of November 11, 1918, a considerable amount of newspaper space was given to the matter of narcotic drug addiction in the United States. Much of this was alarmism and was not based on any recognized body of scientific observations. It was, however, the subject of frequent newspaper and editorial comment and was also of interest to a Congressional Investigation Committee. Generally, the public opinion of that time classed the drug addict as a dangerous sex-crazed criminal, or "dope fiend." There were, however, a number of people who felt that this view was not correct and that the addict was a sick person in need of treatment rather than of punishment.

In order to obtain information on this problem, the Service, in the early 1920's, assigned Dr. Lawrence Kolb to conduct field studies in narcotic drug addiction, with particular reference to its nature and trend in the United States, and to carry out experiments on addiction in animals. Doctor Kolb's work during this period has received wide recognition as a major medical and social contribution to the problems of narcotic drug addiction, and the papers which he wrote are still regarded as classics in the field. He estimated that at that time there were approximately 150,000 addicts in the United States. He pointed out that the majority of drug addicts were nervous, unstable individuals and that drug addiction was largely a psychiatric problem. Kolb classified addicts into the following five major categories (Kolb, Lawrence, "Types and Characteristics of Addicts." *Mental Hygiene.* 9:300, 1925):

(1) Normal individuals accidentally addicted, usually as a result of medication in the course of illness.

(2) Individuals with a psychopathic predisposition or tendency characterized by behavior resulting from misinterpretations of environment, but who do not have a well-crystallized personality defect.

(3) Psychopathic personalities, whose volitional and emotional controls are gravely distorted from the normal.

(4) Psychoneurotics, who are partially disorganized by anxieties, compulsions, obsessions, phobias, or psychosomatic illness.

(5) Inebriate personalities, which include individuals in whom alcoholic indulgence, either periodic or chronic, plays an important role in precipitating addiction.

Kolb developed the concept that these unstable individuals used morphine or similar drugs to obtain either positive or negative pleasure. By positive pleasure he meant elevation to a higher emotional plane and by negative pleasure, the relief of discomfort arising from either physical causes or emotional tensions. He pointed out that continued use of morphine and opiate derivatives brought about a certain amount of physical depletion and resulted in deterioration of character from several causes: the secrecy of the habit; the practice of evading issues by blotting them out with a narcotic instead of facing them openly; the parasitic life that most addicts live; and the contacts with criminals, which have to be made in order to keep up the habit. Kolb found that prior to the passage of the Harrison Narcotic Act in 1914 there were twice as many women addicts as men. Following passage of the Act, this ratio changed to four males for every female addict.

One of Doctor Kolb's most important contributions concerned the relationship of narcotic drug addiction to crime. He showed that although criminals may use drugs, opiate addiction does not directly lead to crime, except petty crime to support addiction. Histories of addicts who have committed major crimes or crimes of violence almost invariably show that such criminal activity antedates the use of drugs; their addiction is a part of the psychopathic nature that made them criminals. In such cases narcotic drugs may actually lessen their impulses to violent behavior. Dr. Michael J. Pescor, in a statistical analysis of 1,000 cases admitted to the Lexington Hospital, found that three-fourths of the addicts studied had no record of criminality before addiction and that the type of criminality after the onset of addiction in the great majority of cases was petty law violation, such as shop-lifting, pocket-picking, minor thievery, and violations of the narcotic laws, to support their addiction.

In association with Dr. Albert G. Dumez, Doctor Kolb was able to produce physical dependence on morphine and heroin in monkeys.

SERVICE HOSPITALS FOR TREATMENT OF DRUG ADDICTION

In 1929, feeling that drug addiction was primarily a medical and social problem and that attempts of treatment of addiction by incarceration in prisons was illogical, Congress enacted a law establishing

(From USPHS Records)

Dr. Walter L. Treadway

(From USPHS Records)

Dr. Lawrence Kolb

two United States Narcotic Farms for the confinement and treatment of persons addicted to the use of habit-forming narcotic drugs. The first of the two narcotic farms was built at Lexington, Kentucky, and opened for reception of patients in 1935. The second was established at Fort Worth, Texas, and was opened in 1938. On July 1, 1936, the name "Narcotic Farm" was changed to U. S. Public Health Service Hospital. Following passage of the Act establishing these institutions, the Service undertook further investigations concerning the incidence of addiction in the United States. This work was carried out under the supervision of Dr. Walter L. Treadway, then Assistant Surgeon General in charge of the Division of Mental Hygiene. These preliminary studies were of value in determining the scope of facilities required for the treatment of addiction in the United States, and the information gained by these studies was disseminated through the medium of Service publications.

When the hospital at Lexington was opened in 1935, the program of treatment instituted by Doctors Treadway and Kolb was based on the premise that addicts should be handled as patients rather than as prisoners, even though it was realized that confinement was necessary in most cases. The program of treatment was triphasic: (1) withdrawal of drugs; (2) rehabilitation of the addict; and (3) assistance to the patient in finding employment and taking his place in society following discharge from the hospital.

In earlier investigations Doctor Kolb concluded that many of the withdrawal treatments in vogue were not only unscientific but actually harmful to the addict and that the best means of denarcotizing addicts available at that time was rapid reduction of morphine. In various modifications, this method of withdrawal was used at the Lexington Hospital until 1946, when it was replaced by the method of substitution of methadone for morphine followed by rapid reduction of methadone.

The rehabilitation program included adequate medical treatment of any correctible physical defects which the addict had, a program of vocational therapy designed to maintain or add to any skills which the addict already possessed, and psychotherapy in selected cases.

Programs for placement and assistance to patients after discharge from the hospital have been developed by an active social service department in each hospital.

The treatment program, as barely outlined, has been refined and improved as the years have passed, under the supervision of the various Medical Officers in Charge: Drs. Lawrence Kolb, Walter L. Treadway, J. Davis Reichard, and Victor H. Vogel, at Lexington; and Drs. William F. Ossenfort, Grover A. Kempf, and Richard B. Holt, at Fort Worth.

Through the year 1950 there have been approximately 35,600 addict admissions at the Lexington and Fort Worth hospitals since their establishment. Slightly more than 60 percent of persons admitted were treated once only. The ratio of prisoner patients to voluntary patients (four to one) in the early years of the operation of the two hospitals has been almost completely reversed, and there has been a definite recent trend toward a lower average age of patients caused by a marked increase of teen-age patients.

INVESTIGATIONS OF DRUG ADDICTION

Further participation of the Public Health Service in research in drug addiction began in 1929 when the Bureau of Social Hygiene of New York, which has been subsidizing research in this field, transferred its funds and functions to the National Research Council. A Committee on Drug Addiction was set up within the Division of Medical Sciences of the National Research Council and Dr. Walter L. Treadway became one of the members. The Drug Addiction Committee later operated on funds granted by the Rockefeller Foundation.

The committee felt that the most hopeful experimental approach to drug addiction was to attempt to develop a drug which would have the pain-relieving qualities of morphine but which would not produce physical dependence in man. This decision was greatly influenced by the fact that procaine, a synthetic drug which did not have the addicting qualities of cocaine, had largely replaced cocaine in medical practice.

In order to implement their program, the committee procured the services of Dr. Lyndon F. Small, an organic chemist at the University of Virginia. Doctor Small first surveyed the literature on the chemistry of the opium alkaloids and published a survey on this subject (Supplement No. 103 to the *Public Health Reports* in 1932). He then gathered a group of organic chemists and graduate students and synthesized more than 500 compounds, all of which were derivatives of morphine or compounds closely allied to morphine.

Once the compounds had been synthesized it was necessary to test them pharmacologically. In order to accomplish this task the Drug Addiction Committee established a pharmacologic team at the University of Michigan, under the leadership of Dr. Nathan B. Eddy. Doctor Eddy and his group surveyed all the available literature on the pharmacology of the opium alkaloids and published this tremendous work as Supplement No. 165 to the *Public Health Reports* in 1941. Doctor Eddy and his collaborators found that chemical alteration of morphine molecules in two locations produced changes in the pharmacological action of these drugs which were fairly well predictable. Chemical substitutions in other positions produced pharmacological changes which were less easily predictable. The results of the investigations appeared in various chemical and pharmacological journals and were finally disseminated as a published collection of reprints of all the projects completed between 1929 and 1941.

When the funds granted to the Drug Addiction Committee by the Rockefeller Foundation were exhausted in 1939, both Doctors Small and Eddy were brought to the National Institute of Health where they continued their work. In 1942 the exigencies of World War II made it necessary for both Doctors Small and Eddy to discontinue work in the field of analgesic compounds and to turn their attention to development of antimalarial drugs.

After the war it was possible to return to the field of pain relief, and in particular to promote the production and use of metopon in chronic pain, as well as other promising morphine derivatives and analgesic drugs of purely synthetic origin. This research was greatly stimulated by acquisition of the German drug "Methadone." Desoxymorphine, dihydroisocodeine, and 6-acetyldihydromorphine are other outstanding contributions from the laboratories of the National Institutes of Health.

Doctors Small and Eddy have received international recognition for their outstanding work. Both are members of the Expert Committee on Narcotic Drugs of the World Health Organization. They were co-recipients of the first annual scientific award of the American Pharmaceutical Manufacturers' Association.

In order to determine the addicting properties of the drugs synthesized by Doctor Small and tested pharmacologically by Doctor Eddy, it was

necessary to carry out experimental work utilizing human subjects, because the differences between man and the lower animals are very great with respect to the development of addiction to drugs.

Clinical investigations of the addiction liabilities of the most promising drugs developed by Doctors Small and Eddy began in 1934 at the U. S. Penitentiary at Ft. Leavenworth, Kansas. These investigations were under the supervision of Dr. Clifton K. Himmelsbach who was especially trained by the Service for this type of work. At Ft. Leavenworth, Doctor Himmelsbach devised the substitution method of the study whereby drugs of unknown addiction liability were given to newly admitted addicts (pharmacologic grafting). This method of study was based on the hypothesis that addictions to various drugs are nearly identical disturbances in physiology and that if a new morphine derivative would satisfy an already established dependence on morphine it would, itself, be capable of producing physical dependence. Among the outstanding contributions of the work at the penitentiary at Ft. Leavenworth were the demonstrations that codeine, dilaudid, and desomorphine were addicting.

When the Lexington Hospital was opened in 1935 Doctor Himmelsbach was transferred to that institution and, with the support of Doctors Kolb and Treadway, it became possible to expand and intensify research in drug addiction. Studies of the addicting liabilities of the new morphine derivatives developed by Doctors Small and Eddy were continued and, in addition, a coordinated study of drug addiction from several viewpoints was initiated. In order to carry out this multiphasic study, a team of individuals working in different disciplines was gathered together. This group included:

1. Dr. Clifton K. Himmelsbach as clinician and pharmacologist,
2. Dr. Ralph R. Brown as psychologist,
3. Dr. Edwin G. Williams as physiologist,
4. Dr. Fred W. Oberst as biochemist,
5. Dr. Robert H. Felix as psychiatrist, and
6. Dr. Howard L. Andrews as biophysicist

This team made many important contributions to our knowledge concerning drug addiction. Among their outstanding results were: (1) the development of a semi-quantitative method for evaluating the

degree of abstinence from morphine; (2) proof that many methods of withdrawing drugs were of no value and were actually harmful; (3) determination of the comparative addiction liabilities of many derivatives of morphine; (4) proof that demerol, the first synthetic analgesic with morphine-like action, was addicting; (5) demonstration that morphine reduced the intensity of physiological changes elicited by anxiety-producing or disturbing stimuli; (6) an outline of the electroencephalographic changes during addiction and withdrawal; (7) the demonstration that morphine was excreted largely as a conjugated product (bound morphine); and (8) studies on the relationship of the autonomic nervous system to physical dependence.

The outstanding drug developed in this program was metopon (methyldihydromorphinone), a derivative of morphine, which appears to have considerable advantages as an analgesic for use in individuals with chronic pain.

At about this time Dr. Harold G. Wolff of Cornell University Medical School developed a unique method for determining the pain threshold in man. Naturally, this was applied to studying the effects of drugs used to relieve pain, including morphine. His findings were of such a nature as to lead him to the view that morphine analgesia was more a function of reducing man's reaction to pain than of reducing the sensation of pain itself. This interesting method and hypothesis have been subjected to intensive investigation by the Lexington research group ever since. It was Andrews who first substantiated Wolff's hypothesis by making simultaneous recordings of the pain threshold and skin galvanic reflex responses to pain as influenced by morphine. Subsequently, the work has been extended and confirmed, and more has been learned about how morphine interferes with the emotional reactions to pain.

On the basis of tests carried out by the Lexington group, Doctor Himmelsbach and his co-workers evolved an important hypothesis of the origin of physical dependence which states that tolerance to morphine is due to the enhancement of certain homeostatic mechanisms that oppose some of the actions of morphine. As injections of morphine are repeated during the course of addiction, these physiologic counter responses become better developed. When morphine is withdrawn, the

counter responses are still operative but are unchecked because no drug is present to oppose them, hence withdrawal symptoms appear. This hypothesis is still the most logical and the most widely accepted explanation of the development of tolerance and physical dependence during addiction to morphine.

In 1944, following Doctor Himmelsbach's transfer, Dr. Edwin G. Williams became Director of Research at Lexington. During his tenure an important study on marihuana addiction was carried out. This study showed that tolerance and dependence did not develop during the course of chronic marihuana smoking.

In 1945, Dr. Harris Isbell became Director of Research at the Lexington Hospital. Since 1945, drug testing has become even more important due to the development of numerous synthetic analgesics. Among the most interesting of these drugs is methadone, a German synthetic analgesic which, though chemically not related to morphine, has pharmacological actions almost identical to those of morphine. This drug produces physical dependence in both man and dogs, although the manifestations of dependence in both species are quite different from those of dependence on morphine. Methadone can be substituted for morphine without signs of abstinence appearing following withdrawal of methadone. Symptoms of abstinence are much milder than those after withdrawal from morphine. This fact led to the development and method of withdrawing morphine by substitution of methadone for morphine and reduction of the methadone.

The addicting liabilities of many other drugs of both the methadone and the demerol series have been determined.

An experimental study of chronic barbiturate addiction in man was carried out which showed definitely that barbiturates should be regarded as addicting drugs and that in some ways addiction to barbiturates is more harmful than addiction to morphine.

Since 1943, extremely important studies of the neurophysiology of addiction have been carried out in the Lexington laboratories by Dr. Abraham Wikler. Doctor Wikler showed that physical dependence could be developed in dogs whose spinal cords had been severed and in dogs whose cerebral cortices had been removed. Doctor Wikler's experiments showed that physical dependence was due to diffuse physio-

logical changes in the nervous system and his results support Himmelsbach's hypothesis of the mechanism of physical dependence.

The record of the activities of the Public Health Service in the field of drug addiction is notable. The hospitals pioneered in this very difficult field and have developed methods of treatment which have returned many unfortunate individuals to active, useful lives. By removing and segregating other addicts from the remainder of the population, the hospitals have contributed greatly to the prevention of drug addiction, since this condition, like the infectious diseases, spreads from person to person. As psychiatry improves, the results of treatment of addicts can be expected to become even better.

On the investigative side, the Public Health Service has contributed materially to knowledge of drug addiction. The need for continuing research remains great. The knowledge of the psychiatric alterations that lead to drug addiction is still extremely scanty. Information concerning the physiological changes that occur during addiction to morphine is still known only in outline, and only a bare beginning has been made in studying the pathological physiology and psychology of addiction to barbiturates and marihuana. The rapid development of the new classes of analgesic drugs makes the continuing study of the addicting liability of these substances necessary. Within the limits of funds and personnel available, the Service will meet the challenge which these remaining problems present.

At this writing (1950) it seems likely that the public health approach —preventive mental hygiene, health, and social rehabilitation, and a nonaddictive substitute for morphine's pain relieving effect—is essential to make substantial additional inroads into the drug addiction problem.

Studies of the Use of Tetraethyl Lead Gasoline in Its Relation to Public Health

Early in 1923, lead tetraethyl began to be used in gasoline in an endeavor to increase the efficiency of the gasoline as a motor fuel. The possible danger from such wide distribution of a lead compound aroused fear on the part of those concerned with the public health, and these fears were intensified when fatal poisoning occurred in the manufacture

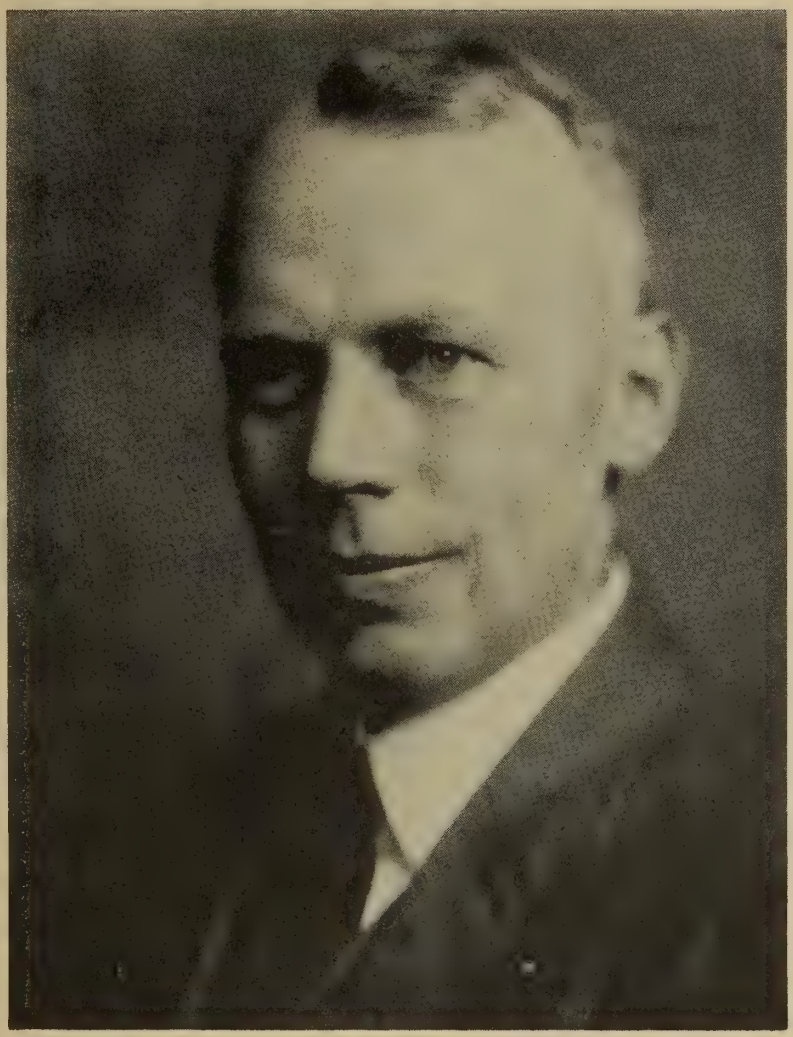
and mixing of the concentrated tetraethyl lead itself in several States. As a consequence of such apprehensions, the distribution of tetraethyl lead was stopped on May 5, 1925, and the sale of gasoline containing tetraethyl lead was thereafter generally discontinued.

In May 1925, a conference was called by Surgeon General Hugh S. Cumming to consider the possible health hazards from the manufacture, distribution, and use of this lead compound as a substance to be added to gasoline. Those in attendance at this conference generally recognized that the production and handling of the concentrated tetraethyl lead involved a distinct industrial hazard, and attention was principally focused on the question which remained open as to the dangers to the public, to automobile drivers, and to garage workers from the general use of lead-containing gasoline. Reports were made to the conference of studies relating to this matter that had been conducted at three different places—the Bureau of Mines Laboratory at Pittsburgh, Columbia University at New York City, and the Ethyl Gasoline Corporation, Dayton, Ohio.

After considerable discussion of the various phases of the problem, the conference adjourned, having agreed to a resolution which stated that Surgeon General Cumming would appoint a committee of seven recognized authorities in clinical medicine, physiology, and industrial hygiene to present to him by January 1926, a statement as to the health hazard involved in the retail distribution and use of tetraethyl lead gasoline motor fluid.

Dr. James P. Leake of the Service was placed in direct charge of the field investigations that were necessary in making this study. A great deal of careful planning, as well as exact field and laboratory work, was necessary. The results of these studies that were carried out under the personal direction of Doctor Leake stand as a model for precise, accurate, expeditiously conducted, and conclusive scientific investigation.

In October 1925, Doctor Leake reported to a meeting of the committee the results of the investigations up to that time. About the middle of December, the committee met to consider the full report of his investigations. Based upon these studies, suggested regulations were drawn by the Public Health Service in regard to the manufacture, distribution, and use of tetraethyl lead and mixtures containing tetraethyl



(Harris & Ewing, Washington, D. C.)

Dr. James P. Leake

(From USPHS Records)

Benjamin E. Holsendorf

lead for adoption and enforcement by the several States. These proposed regulations were presented to the Conference of State and Territorial Health Officers in May 1926, for discussion and approval. The general conclusions drawn from this study indicated that:

(1) Drivers of cars using tetraethyl gasoline as a fuel and in which the concentration of tetraethyl lead was not greater than one part to 1,300 parts by volume of gasoline showed no definite signs of lead absorption after exposures approximating two years.

(2) Employees engaged in the handling and repairing of automobiles, and employees of automobile service stations may show evidence of lead absorption and storage. In garages and filling stations in which ethyl gasoline was used, the amount of apparent absorption and storage was somewhat increased, but the effect was slight in comparison with that shown by workers in other industries where there was a severe lead hazard and for the periods of exposures studied was not sufficient to produce detectable symptoms of lead poisoning.

(3) In the regions in which ethyl gasoline had been used to the greatest extent as a motor fuel for a period of between two and three years, no definite cases had been discovered of recognizable lead poisoning or other disease resulting from the use of ethyl gasoline.

Therefore, the general conclusion was reached that no good grounds were present for prohibiting the use of ethyl gasoline of the composition specified as a motor fuel, provided that its distribution and use were controlled by proper regulations.

This study and the regulations based upon it are an excellent example of cooperation on the part of public health authorities and on the part of industry in handling a substance that could have had a marked deleterious effect upon the health of thousands of persons throughout the country. This method of handling an important industrial hazard set a desirable pattern to be followed later.

Ratproofing of Ships

For many years periodic fumigation and rat trapping were the only effective measures for controlling the prevalence of rats on ships. Although sulphur dioxide, and even the deadly hydrocyanic acid gas since

1913, were being used in the fumigation of ships, not infrequently live rats were seen on these vessels following fumigation. It became evident that improved methods of reducing rat life aboard ships must be developed, particularly since it was obvious that closed areas often were not penetrated by the fumigating gases, and that some method must be devised to permit the penetration of fumigating gases to all parts of the ship.

In another chapter it has been noted that Dr. Richard H. Creel and two or three other officers were assigned to San Juan, Puerto Rico, in 1912 to control an outbreak of bubonic plague. At that time Dr. Samuel B. Grubbs was Chief Quarantine Officer at the port of San Juan. Having served at San Francisco in plague work, Doctor Creel was familiar with the ratproofing program that had been carried on there. Accordingly, he promptly instituted ratproofing in San Juan, adding the requirement of standard specifications and practices. This applied to piers, water front buildings, and other structures. This was the first time that specified standards had been incorporated in ratproofing operations.

Pharmacist Benjamin E. Holsendorf,* who was on duty at the San Juan Quarantine Station at the time of the outbreak of bubonic plague in 1912, had charge of all the fumigation work. He was aware that oftentimes fumigations were not effective because of closed-in spaces and closed-in pipes. He conceived the idea of opening end casings of closed-in pipes and other dead-end spaces in ships for the purpose of creating freer penetration of the sulphur fumes then used as a fumigant. Mr. Holsendorf was familiar with the ratproofing work that was being done in the city under the direction of Doctor Creel.

Mr. Holsendorf continued on duty in Puerto Rico until 1918, in charge of fumigation and related activities at the Quarantine Station. For some time he had been turning over in his mind various means by which all parts of ships might be made more accessible to fumigating gases. He also conceived the idea that perhaps by making certain structural changes on the ships, the work of ratproofing them could be accom-

*Mr. Holsendorf was a native of Virginia. His training in pharmacy was received at Howard University, where he graduated in 1896. He entered the Service in 1897 and was retired in 1938. He died in 1944.

plished very much along the line of the work that he had seen done under Doctor Creel's direction in San Juan. Recognizing the benefits of pooled knowledge and competent counsel, Mr. Holsendorf discussed various phases of this problem with Doctor Grubbs and other experienced quarantine officers of the Service.

In 1920, Mr. Holsendorf was assigned to the Quarantine Station at Rosebank, New York. There again Doctor Grubbs was the officer in charge. Having developed the idea of ratproofing for ships, Mr. Holsendorf's active and searching mind worked at it constantly. Several years more, however, were required for the different phases of ratproofing of ships to evolve as a practical and accepted procedure. In the beginning the plan was to eradicate the worst rat harborages each time a ship came into port. Some work would be accomplished each time the vessel entered port until finally the ship became practically ratproof. Efforts were also made to eliminate rat harborages (enclosed spaces) with gnaw-proof material, or else to expose the enclosed space in such manner as to cause the rats to abandon using the space. It became evident that the best time to ratproof a ship was during its initial construction; therefore, the idea developed that in the planning and design of each ship, the requirement of ratproofing should be included as a definite item.

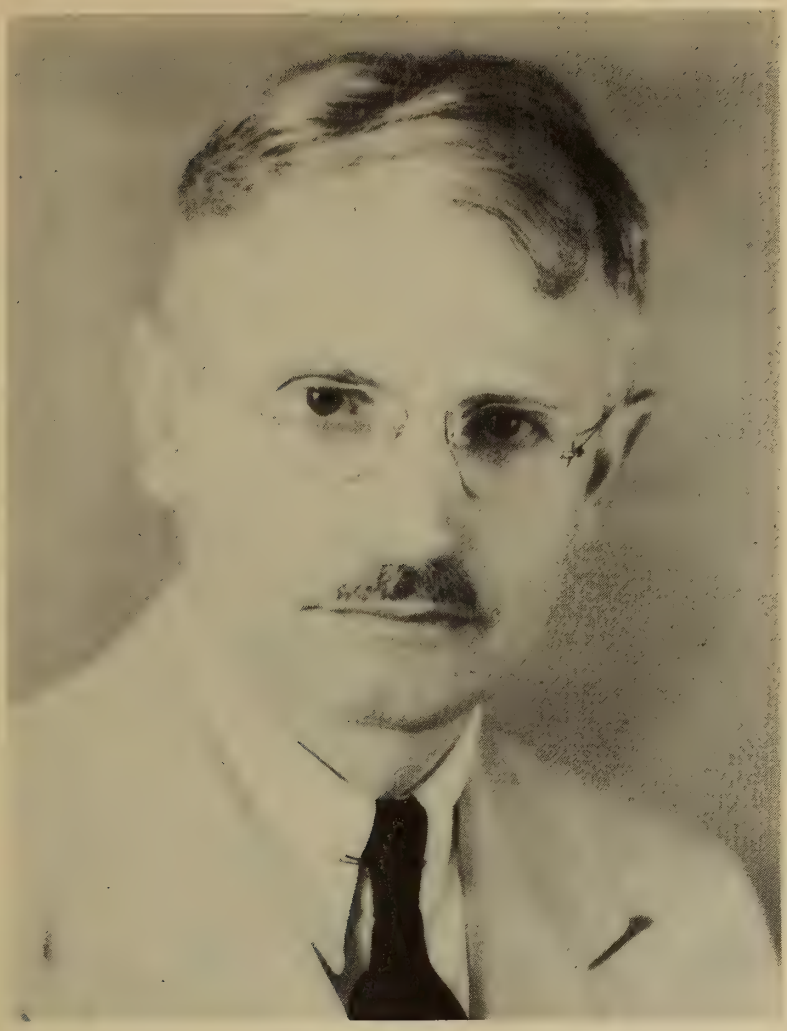
Mr. Holsendorf worked continuously in studying the habits of the rat—how rats lived on ships, how they moved at will or as necessity demanded, living in one section and feeding in another; where they might find temporary harborage in which to hide and permanent harborage in which to nest and rear their young. These and many other hitherto unrecorded facts about the rat were noted. Doctor Grubbs served as consultant and adviser to Mr. Holsendorf during this period. They reasoned logically that if the nesting places and harborages for rats were eliminated, the possibility of rats finding places to colonize on board ship would be greatly diminished, and the few rats which might gain access to the ship could be easily uncovered and more completely exposed to the gaseous fumigant and killed. Rats may enter a ratproof ship, but the difficulties of life and risks of extermination are too great for them to overcome and thus they disappear, provided, of course, the ship is kept otherwise free of conditions affording them livelihood.

Rat infestation on ships not only constitutes a potential risk of transmission of bubonic plague but is a direct cause of economic loss. In seeking and securing food, rats damage, destroy, and consume property, as well as create objectionable conditions. They live at the expense of the ship operator, whether they subsist upon cargo or ship stores, and the losses due to their depredations increase the cost of operation. The necessities of rat life are: (1) Access to food and drink; and (2) breeding, hiding, and nesting places. Wherever these are available, rat infestation is not only possible but probable. It can be permanently prevented only by depriving rats of their necessities of life.

It required a number of years to develop the principles and technique of effectively ratproofing vessels, but by 1929 this work had been placed upon such a firm basis that the details and specifications became standardized. Detailed specifications, with drawings and illustrations prepared by the Public Health Service, were made available to persons interested in the operation and construction of seagoing vessels. A comprehensive description of the methods and technique of the ratproofing of vessels, under the authorship of Doctor Grubbs and Mr. Holsendorf, was published in 1931 as Supplement 93 to the Public Health Reports.

Ratproofing briefly outlined consists of: (1) Placing foodstuffs, both supplies and refuse, in ratproof containers or within spaces devoid of rat harborages and into which they cannot enter; (2) eliminating dead spaces in the structure as far as possible, and screening or closing those which are unavoidable; also screening or closing all small openings accessible to rats, with ratproof material; and (3) closing service openings by substantial metal screens or well-fitted doors or windows which are impenetrable to rats.

Ratproofing was developed on a voluntary and cooperative basis by the Public Health Service, shipbuilders, and ship operators. After practical demonstrations on several large passenger ships, private shipping corporations and the Government became convinced of the soundness of ratproofing of ships, both those under construction and those in service. As early as 1925, ship ratproofing, as a measure of preventing the spread of bubonic plague, had assumed international public health importance and was an important part of the agenda at several international health meetings held under the auspices of the



(From USPHS Records)

Leslie C. Frank

International Office of Public Health and the Health Section of the League of Nations. Standards for the ratproofing of ships were adopted and promulgated by several foreign governments.

In 1944, the ratproofing of vessels of United States registry engaged in traffic to foreign countries became a responsibility of the Sanitary Engineering Division of the Public Health Service, and, in 1948, this work became a function of the newly created Division of Sanitation.

The further development of ratproofing techniques introduced consultative plan review services to naval architects, shipbuilders, and operators which permitted the consideration and incorporation of ratproofing features during the design stages of a vessel's development. The benefits of these services, and those accruing from close inspectional activities, were reflected in a remarkable decline in the number of rat-infested vessels.

Rats, when found aboard, are often recovered following fumigation or trapping operations in areas not formerly frequented by them. This is a result of ratproofing features which have excluded the rat from his preferred harborage, and which indicate that he has been obliged to seek temporary harborage in spaces which he would have abandoned had he been afforded an opportunity of choice. Not only are rats found today on comparatively few vessels of United States registry, but they are observed to be present in increasingly smaller colonies, and often the extent of infestation is limited to a single rat.

The ratproofing of ships is now generally accepted and required. As a consequence, ship fumigations in United States ports are now relatively negligible in number, having decreased from 6,607 in 1925 to 143 in 1950, a ratio of 46 then to one in 1950. The resultant savings in money and effort to industry and Government have been tremendous.

Milk and Food Sanitation

EARLY STUDIES

Although the Marine Hospital Service was interested in various phases of the public health aspects of the use of milk, it was not until 1906 that an extensive study was made of the problem. An investigation by the Service during the summer of 1906 of the origin and prevalence

of typhoid fever in the District of Columbia revealed that milk was the agent of transmission in 10 percent of the 866 cases studied. Following this disclosure a thorough study, both practical and scientific in character, was made of the relation of milk to the public health. Results of this study were published in 1908, as a *Hygienic Laboratory Bulletin,* and an enlarged and revised edition was published in 1909. Coincident with this work, a study was made of thermal death points of pathogens in milk by Dr. Milton J. Rosenau. Results of this study gave impetus to the use of low temperatures for pasteurization of milk supplies, and were an important factor in development of the holding method of pasteurization as contrasted with the flash method in use at that time.

The Public Health Service took an active interest in various efforts directed toward improvement of milk supplies, among which was the certified milk movement. However, experience indicated that even the elaborate sanitary precautions recommended in this connection were not sufficient to insure against the possibility of milk-borne outbreaks of disease. It became evident that in the extension of pasteurization of milk supplies lay opportunity for accomplishing the best results, and the Service devoted its energies in that direction.

In 1911, the New York Milk Committee appointed the Commission on Milk Standards. The Public Health Service was represented on this commission at the time of its first and second reports, and published three reports of the commission in the *Public Health Reports* during the years 1911, 1913, and 1917. In 1921, a large dairy corporation began an exhaustive study of time and temperature standards for commercial pasteurization of milk and of equipment in general use at the time, including engineering and bacteriological tests with pathogenic organisms. The Public Health Service cooperated in this research and published the results of the investigation in 1925 as *Public Health Bulletin* No. 147.

OFFICE OF MILK INVESTIGATIONS ESTABLISHED

Milk sanitation investigations became a definite entity in the Public Health Service in 1923. At that time the Alabama State Board of Health, feeling the need for a State-wide milk control program, requested the assistance of the Service in the development of such a pro-

gram. Leslie C. Frank, a sanitary engineer of the Public Health Service, was assigned to cooperate with the Alabama State Board of Health in this work. This action inaugurated the activities of the Office of Milk Investigations.

ORIGIN OF STANDARD MILK ORDINANCE

The work in Alabama centered around a cooperative effort to unify milk control methods throughout the State by the development and enforcement of an effective type of milk legislation. In the preparation of this legislation, a thorough study was made of a large number of milk ordinances in effect at that time. One striking fact brought out in this study was that practically no two milk ordinances contained the same requirements. This indicated the need for a milk ordinance which would be applicable to communities in general, and led to development in 1924 of the milk ordinance which was first known as the Standard Milk Ordinance and later as the Milk Ordinance Recommended by the U. S. Public Health Service.

The success of the milk sanitation work in Alabama attracted the attention of other States and cities, and within three years nearly 100 communities had enacted this milk ordinance into law. At the request of the State health departments, a milk specialist was assigned to a number of States to assist them in organizing a milk sanitation program and to study the effect of applying a uniform State-wide program. Surveys were made in Alabama (1927), in Mississippi (1930), and in Missouri (1931), to measure the results of the enforcement of the ordinance. In May, 1926, the Standard Milk Ordinance of the U. S. Public Health Service, slightly modified, was adopted as a standard for the United States by the Conference of State and Territorial Health Officers.

STANDARD MILK CODE

It soon became evident that even though communities adopted the same milk ordinance, the interpretation and enforcement of the ordinance were not necessarily uniform. This led to the formulation of the Public Health Service Milk Code, which discusses the Standard Milk Ordinance item by item, outlines in each case the public health reason therefor, and gives what is recommended as satisfactory compliance with

each item. The first edition of the Code, a tentative draft, was published in mimeographed form in 1927.

During its formulation, the Standard Milk Ordinance and Code was referred to a number of public health and dairy organizations for critical study in order to have the advantage of review by a large number of groups and individuals. After a series of conferences with the Bureau of Dairy Industry of the U. S. Department of Agriculture, the 1931 and succeeding editions of the Milk Ordinance and Code have carried the approval of that organization.

In 1932 the Public Health Service appointed a Milk Sanitation Advisory Board, so that it might have at its command the technical advice of a comprehensive group of experts in the various phases of the public health control of milk supplies, and in allied problems relating to the production, processing, and distribution of milk. This 16-member Milk Sanitation Advisory Board was replaced by a seven member Sanitation Advisory Board to advise on all sanitation activities when the Sanitary Engineering Division was established in 1943.

New editions of the Milk Ordinance and Code are published when needed. Eleven editions of the Code have been issued, the first printed edition having been published in 1935 as *Public Health Bulletin* No. 220, and the latest revision having been published in 1939. All editions beginning with that of 1933 were compiled by Mr. Abraham W. Fuchs, a sanitary engineer of the Service.

EXTENT AND ADOPTION OF MILK ORDINANCE

The first State to adopt the model milk ordinance as State regulations, was Kentucky, in 1925. Then came Mississippi in 1927, Alabama in 1929, and North Carolina in 1930. The first large cities to adopt it were Mobile and Montgomery in 1923, Knoxville in 1924, and Atlanta and Chattanooga in 1925. The first counties adopted it in 1927.

INVESTIGATIONS NECESSARY IN DEVELOPMENT OF CODE

Investigations on the efficiency of commercial milk pasteurization equipment were undertaken in 1926 by Leslie C. Frank, Frederic J. Moss, and Peter E. Lefevre. The studies indicated that some of the equipment then in use could not be depended upon to pasteurize effec-

tively. Some of the defects found consisted of "dead ends" or "cold pockets" which were beyond the influence of heating and agitation devices, foam which was lower in temperature than the milk, leakage of milk past inlet and outlet valves, and lack of dependability of some temperature control equipment. As a result of these findings, many of the pasteurization equipment manufacturers modified designs of their equipment.

For a considerable period of time following the replacement of flash pasteurization by the holding method in this country, use of flash pasteurization was not considered acceptable by American health officials due to its lack of dependability. Beginning in 1927, the U. S. Public Health Service, in cooperation with the New York State and New York City Health Departments, made studies of electric flash pasteurization, including engineering observations and tests with pathogenic bacteria. Later the Public Health Service made similar studies of an internal tubular type of steam flash pasteurizer, and in cooperation with the Pennsylvania State Health Department made engineering tests of a plate-type steam flash pasteurizer. On the basis of this work, it was recommended that local and State health authorities approve the use of equipment which would heat every particle of milk to not less than 160 degrees F., followed by a holding period of not less than 15 seconds at not less than this temperature. It was specified that the equipment must comply with certain listed specifications, including a safety device designated as an automatic milk-pump cut-out which would stop the milk pump when the milk temperature at the heater outlet dropped below the legal requirement. Because of the use of a short but definite holding period in this method, it was designated as high-temperature short-time pasteurization rather than flash pasteurization.

Because of the increase in use of hot-air cabinets for the bactericidal treatment of milk utensils and containers, tests were made in 1937 to determine an effective and practicable temperature and holding time that would insure the desired reduction of milk-borne disease producing organisms.

The use of regenerators (also known as heat exchangers or regenerative heater coolers) presents a possible source of contamination of the pasteurized milk by the raw milk. This might occur either directly, as in milk-to-milk regenerators, or indirectly, as in milk-to-water-to-milk

regenerators, unless certain requirements are met as to relative pressures in the system. The technical difficulties involved in complying with adequate requirements were such as to warrant a detailed study of the problem in 1938.

Practically all valves used in milk lines will leak sooner or later, due to the inevitable scoring of the seat during service, thus permitting leakage of incompletely pasteurized milk into the pasteurized supply. Several designs of leak protector valves were developed by Abraham W. Fuchs in 1938, and were made available to the industry by publication in *Public Health Bulletin* No. 220 (1939 edition).

In practically all cases where foam is present in the pasteurization vat it is lower in temperature than the milk, thus permitting disease producing organisms to survive. Foam temperatures were encountered which were as much as 35 degrees F. lower than the temperature of the milk during the holding period. Experiments with enclosed heaters were unsuccessful but live steam admitted to the air space above the milk not only heated the foam but also tended to dissipate it. Designs of air-space heaters were developed in 1939 by Frederic J. Moss and Abraham W. Fuchs, sanitary engineer officers of the Service, for various types of pasteurizers.

Although automatic pasteurization installations, either of the 30-minute or the high-temperature short-time type, must of necessity be provided with thermostatic control of the temperature of the milk, the Milk Ordinance and Code also specifies that such installations be provided with automatic milk-flow stops. These stop the forward flow of milk whenever its temperature drops below the required limit due to any cause whatsoever, and automatically restore forward flow when it again reaches the required temperature. The requirement for the use of milk-flow stops necessitated the development of specifications for the design of the flow stops and for their location.

There has been a decided trend toward the use of automatic pasteurization equipment, and an accompanying increase in the sanitary engineering problems involved. In addition to the milk-flow stops, other safeguards, of both design and operation, were developed to insure that the required pasteurization temperature and time will be applied to every particle of milk and milk products.

Studies by the National Institute of Health and the California State Department of Health in 1948 indicated that the Q fever rickettsia, *Coxiella burnetii* occasionally survives pasteurization by both the vat process and the high-temperature short-time method. Accordingly, a study was begun in 1950 by the University of California and the U. S. Public Health Service, to determine the thermal death times of *Coxiella burnetii* in milk at various temperatures. The laboratory scale studies now in progress will be followed by full scale experiments in commercial pasteurization equipment of various types. The results will determine whether the present pasteurization temperature-time standards are adequate.

OTHER INVESTIGATIONS

The first extensive publication on milk issued by the Public Health Service includes a compilation by Dr. John W. Trask of 500 milk-borne outbreaks of disease which had appeared in the literature up to that time (1908). In Supplement No. 62 to the *Public Health Reports* this compilation of milk-borne outbreaks of disease is continued by Drs. Charles Armstrong and Thomas Parran so as to complete the data for the United States as published up to January 1, 1927. The Public Health Service has, since 1923, compiled annual summaries of milk-borne outbreaks of disease as reported to it by health authorities in the United States in response to annual questionnaire surveys. These compilations indicate that reported milk-borne outbreaks of disease in the United States have declined from about 40-60 per year in the 1920's to about 20 per year in recent years. Practically all of these outbreaks are due to raw milk supplies; and for the most part they occur in small cities and towns where a large part of the population is still served by raw milk supplies.

Although practically all health authorities feel that pasteurizing milk has no significant effect upon its food value, the question nevertheless continues to arise from time to time in those communities in which considerable raw milk is still being sold. As this problem was a pressing one with a number of health officers, in 1931 the Public Health Service made surveys of 39 cities covering a total of about 3,700 white children of 10 months to six years of age. The final conclusion of this study was that, taking into account the average supplementary American child diet,

children who are fed pasteurized or other heated milk thrive as well as children who are fed raw milk, and contract certain communicable diseases less frequently. To combat unsupported claims by raw milk advocates in recent years, a review article on this subject was prepared by Messrs. John Andrews and Abraham W. Fuchs in 1948 at the request of the Council on Foods and Nutrition of the American Medical Association.

Municipalities considering the adoption of the Public Health Service Milk Ordinance frequently inquire as to probable cost of enforcement. A questionnaire survey was undertaken by Leslie C. Frank and Abraham W. Fuchs in November 1934 to determine local cost of milk control in those cities which were satisfactorily enforcing the Public Health Service Milk Ordinance, as evidenced by milk sanitation ratings of 90 percent or more. On the basis of the information received from 74 such cities, ranging in population from less than 1,000 to over 300,000, the mean cost of milk control in 1934 was 8.3 per capita per year, 0.46 cent per gallon of milk, or $47.00 per producer or plant per year.

Other questionnaire surveys were made on the extent of pasteurization and tuberculin testing in 1923, 1927, and 1931, and an extensive survey on municipal milk control was made in 1936. A national inventory of needs for milk pasteurization facilities was undertaken in 1943.

In order to measure the degree of milk ordinance enforcement, the Public Health Service developed a milkshed rating method which it and many of the State health departments have used. The method was described and standardized in 1938 by sanitary engineer officers of the Service.

EXPERIMENTAL LABORATORY

Increasing use of automatic pasteurization systems brought new problems in design and operation of equipment. This necessitated development of additional specifications for inclusion in the Ordinance and Code. Some of the numerous problems required considerable study and research, and in order to deal most effectively with them an experimental laboratory was added in 1933 to study problems chiefly of a bacteriological and engineering nature. Some of the investigations previously mentioned were carried out in this laboratory. The pasteuriza-

tion equipment in use in the laboratory was all full-scale commercial equipment.

Considerable time was given in this laboratory to the development of a satisfactory procedure for using a nonpathogenic test organism for various milk sanitation studies. The test organism was originally isolated by Abraham W. Fuchs from pasteurized milk in 1931 and its resistance to heat and chlorine determined on a laboratory scale. An extensive study was later made by Frederic J. Moss, Robert C. Thomas, and Mildred K. Havens of the thermal characteristics of this test organism, a strain of *Escherichia coli,* and cultures were developed which are somewhat more heat resistant than the most heat-resistant milk-borne disease producing organism. This test organism was used in a study of the bactericidal effect of the paraffining of container board used for single-service paper containers.

The experimental laboratory was discontinued with the outbreak of World War II. Laboratory researches in milk and food sanitation problems were inaugurated in 1945 at the Water and Sanitation Investigations Station in Cincinnati, later known as the Environmental Health Center.

Among these were studies of the effects of detergents on water hardness in 1946 by Edward H. Mann, Clarence C. Ruchhoft, and Francis I. Norris, who the same year developed a performance test for rating the over-all efficiency of various detergents used in cleaning milk and food utensils. In 1948 George R. Weber and Luther A. Black developed a laboratory procedure for evaluating the practical performance of quaternaries and other germicides proposed for sanitizing food utensils. Staining procedures for the microscopic examination of milk were studied by Benjamin S. Levine and Luther A. Black, and a new procedure was proposed in 1948. In 1949 Robert C. Thomas investigated the operation of several types of home milk pasteurizers and suggested improvements. In 1950 the germicidal properties of chloramine-T were investigated by Black and of quaternary ammonium compounds by Chester T. Butterfield, Elsie Wattie, and Cecil W. Chambers.

WORLD WAR II ACTIVITIES

The wartime shift of population to military and war-industry areas created problems in sanitation. Under the Emergency Health and Sani-

tation Program, milk and food specialists were called to active duty in the Reserve Corps and assigned to such areas to assist military and civilian health authorities in developing adequate supplies of safe milk and in improving restaurant sanitation. In 1944, 24 milk and food specialists were on duty in war areas, in addition to 16 assigned to the nine District offices. Seven mobile laboratories were equipped and assigned to war areas lacking laboratory facilities. During 1944 these mobile laboratories examined over 30,000 samples of milk, water, and restaurant utensils in 88 war areas in 22 States and found many unsanitary conditions. These programs were discontinued in June 1946.

Beginning in 1941 Luther A. Black, a bacteriologist, was assigned to a survey of milk laboratories in war areas to improve their technics and to determine compliance with the Standard Methods for the Examination of Dairy Products recommended by the American Public Health Association. By the end of 1943 a total of 408 official laboratories had been surveyed in 48 States.

INTERSTATE MILK SHIPMENTS

In times of local milk shortages, the acceptance of milk from other milk sheds is made difficult by lack of uniformity in milk regulations. Spurred by the needs of certain States, the Conference of State and Territorial Health Officers in 1944, and again in subsequent years, requested the Public Health Service to prepare a plan for the certification of interstate milk shippers. Accordingly, a plan was developed by the Public Health Service and all States were notified by a letter from Surgeon General Parran dated December 31, 1946. The plan provides for sanitary supervision and ratings of shippers by the State of origin, with certification of such ratings by the Service. The purposes are to improve the quality of milk shipped interstate, to insure receiving areas against laxity of control, and to eliminate multiple inspections of the same source by officials from different areas. The plan was thoroughly discussed and approved at a conference on interstate milk shipments held in St. Louis in June 1950 under the sponsorship of eleven midwestern State health departments.

FROZEN DESSERTS ORDINANCE AND CODE

The Public Health Service became actively interested in frozen desserts sanitation in 1935 when it was invited by the Memphis city health

department to cooperate in formulating the Memphis frozen desserts ordinance. Upon increasing demands from health officers for recommended standards, the first draft of a frozen desserts ordinance was prepared by the Public Health Service for consideration by a specially appointed Advisory Board on Frozen Desserts in July 1937. As a result of discussions several succeeding drafts were prepared. The final draft was published in the January 1940 issue of the *Journal of Milk Technology*. A code was added in the March 1940 draft, and after a further slight revision by the Advisory Board, the May 1940 edition of the Frozen Desserts Ordinance and Code Recommended by the Public Health Service was finally issued in mimeographed form.

In 1949 several industry groups requested guidance from the Public Health Service in establishing standards for high-temperature short-time pasteurization of ice cream mix. On the basis of tests conducted by industry and university interests, the Public Health Service has tentatively approved 175° F. for 25 seconds as being bactericidally equivalent to its present standard of 155° F. for 30 minutes, but has not approved 190°-200° F. with no appreciable holding time, pending results of studies now in progress.

STANDARDS FOR SANITATION OF FOOD ESTABLISHMENTS

The Public Health Service first became actively interested in the sanitation of eating and drinking establishments in 1934. In that year minimum restaurant sanitation regulations were proposed for approval by the National Recovery Administrator. These regulations were never put into effect, as the National Recovery Act was declared unconstitutional by the Supreme Court not long afterwards.

Next, at the request of some health officers for a suggested form of ordinance for local use, the Public Health Service prepared the December 1935 draft of an Ordinance Regulating Food and Drink Establishments. After a detailed study of existing municipal ordinances and State regulations, a tentative Ordinance and Code Regulating Eating and Drinking Establishments was issued in mimeographed form in March 1938. It was not until 1940 that the Sanitation Advisory Board had an opportunity to review the tentative edition and to consider proposed amendments. The first non-tentative edition of the recommended Ordi-

nance and Code Regulaing Eating and Drinking Establishments was then issued in mimeographed form in June 1940.

Experience in the enforcement of the 1940 edition brought suggestions from many health officers for its improvement. These and other suggested changes were considered by the Sanitation Advisory Board in 1942 and, as a result, the first printed edition of the Ordinance and Code was issued as *Public Health Bulletin* No. 220 (1943 edition). This is the current edition. It has been adopted by 29 States, in 19 of which it is enforced state-wide, as well as by 212 counties and 529 municipalities, with a population coverage exceeding seventy million.

A number of problems were involved in drafting an ordinance that would be generally applicable. The question of enforcement methods was settled by offering two different forms of the ordinance, one a grading type which permits enforcement by degrading or permit revocation, or both; the other a nongrading minimum-requirements type enforceable by permit revocation only. In the grading type, the competitive effect of grading on public patronage tends to improve conditions in restaurants, thereby aiding in enforcement.

DISEASE OUTBREAKS FROM FOOD

Since 1938 the Public Health Service has collected and compiled annual reports of disease outbreaks traced to food and water submitted by State health departments, in addition to those from milk and milk products which were begun 15 years earlier. The latest year for which a report has been issued is 1948. During the 11-year period 1938 to 1949, inclusive, there was reported an annual average of 37 outbreaks from water, 34 from milk, and 246 from other foods.

TRAINING AND EDUCATIONAL ACTIVITIES

Since the beginning of the program the Service has trained new State personnel upon the request of the State health departments. This has been accomplished largely by the regional milk and food consultants of the Service working with State sanitarians to demonstrate proper methods of inspection, sampling, laboratory procedures, grading, rating of communities, record keeping, and administration. It also has provided inservice training for State and local sanitarians through seminars of

three to five days' duration conducted periodically in collaboration with the States on a State or Regional basis. During the period 1937 to 1949, 115 milk and food sanitation seminars were held throughout the country with an attendance of over 7,700 State and local sanitarians.

In order to measure the degree of restaurant ordinance enforcement in a community, a rating procedure and form were developed in 1944 similar to those for milk sheds, and have been widely used by the States. When made before the adoption of a local program, and periodically thereafter, such ratings are of value in measuring achievement and stimulating improvement.

Since 1942 major attention has been devoted to the education and training of food and milk handlers. Today it is generally recognized that education of food handlers is an effective method of obtaining compliance with sanitation standards. The Service has conducted a large number of demonstration classes in cooperation with State and local health departments, local restaurant and dairy associations, and other civic groups in order to stimulate the development of food handler training courses by States and cities. Many audiovisual aids were developed for use at these training courses.

SANITARY FOOD EQUIPMENT

A basic requirement of the ordinances recommended by the Public Health Service is that containers, utensils, and equipment shall be so designed and constructed that every food-contact surface is readily accessible for cleaning and inspection and is smooth, noncorrodible, and nontoxic. For many years State and local health departments have, upon request, been furnished confidential opinions concerning compliance of specific materials and equipment as a guide to local acceptance. Manufacturers of equipment have requested assistance in the development of equipment that complies with Service standards and will be acceptable to local and State health departments. As a result of repeated requests from the industry, a policy was adopted by the Service in 1949 of issuing written statements concerning compliance of specific models with its published standards. These requests have involved the investigation of many types of equipment.

CURRENT MILK AND FOOD SANITATION PROGRAM

In its milk and food sanitation activities the Public Health Service acts in an advisory, stimulative, and research capacity. Actual enforcement is the responsibility of State and local regulatory authorities. The Service has no legal jurisdiction in the control of sanitary conditions except in interstate carriers. It is the aim of the Service to promote the establishment of effective, well-balanced milk and food sanitation programs in each State, to stimulate the adoption of effective State and local control legislation, and to encourage adequate enforcement through appropriate legal and educational measures.

Mental Examination of Aliens

In 1904, Dr. Thomas W. Salmon, then a Service officer, who later became an international figure in problems relating to mental health, was assigned to Ellis Island to assist in the mental examination of immigrants. He was followed by others trained in psychiatry and together they attempted to develop techniques for detecting the mentally abnormal under the difficult conditions incident to the examination of several thousand persons in one day. It was eventually found necessary to send officers to appropriate centers for intensive training in the fundamentals of mental disease and mental deficiency.

The detection of the insane was at best difficult because of the small time available for the examination and the multiplicity of the languages spoken by the aliens, usually unfamiliar to the examiners. This examination required trained psychiatrists who by experience on the job developed an acuteness of perception which enabled them quickly to detect symptoms of mental disease. The aliens would walk by the psychiatrist who would turn aside for more intensive individual examination those who showed symptoms that might be evidence of mental abnormality. These deferred cases would then be examined with the aid of an interpreter when necessary and by delving into the personal history from such sources that were available. The detection of insanity, constitutional psychopathic inferiority, chronic alcoholism, and epilepsy naturally depended a great deal on the history. This was not readily available.

The detection of feeblemindedness imposed a different problem. Each examiner became adept at asking a few questions in numerous languages.

Depending upon the nature of the response and also upon the mannerisms of the aliens questioned, they would either be passed on as normal or be turned aside for more intensive examination. There was at first no technique for detecting feeblemindedness except in its grossest forms that would be obvious to anyone. The officers were therefore confronted with the task of developing practical techniques for this purpose and they began to experiment with intelligence tests, especially with performance tests, some of which they personally developed and used, but without at first attempting to standardize them.

INTELLIGENCE TESTING

With the introduction of the Simon Binet test in 1908 there was renewed interest in the diagnosis of mental deficiency by means of tests. It soon became apparent, however, that the Binet system with its given standards for diagnosis was not applicable to immigrants. It was a long time before this was appreciated by workers outside of the Public Health Service who had no practical problem to solve. Some of those working with the Binet system concluded that about 85 percent of certain groups of immigrants were feebleminded. This conclusion was not taken seriously by the Service officers who continued to develop and experiment with tests including the Binet type of test.

Among the officers active in this work were Drs. Howard A. Knox, Grover A. Kempf, Eugene H. Mullan, Walter L. Treadway, and Lawrence Kolb. These officers soon came to the conclusion based on practical experience that the then standardized interpretation of intelligence tests was not applicable to immigrants. It was suspected that persons with equal native ability coming from different cultural strata and with different educational and environmental backgrounds varied greatly in their ability to perform intelligence tests. It was therefore necessary to interpret each group with these concepts in mind and by this system of examination and interpretation, many mentally defective persons were diagnosed and deported.

STUDIES IN EUROPE

Individual skills were developed in these early days but the officers engaged in making the examinations had no reliable standard norms to

guide them in their work. Appreciating that more definite information about the ability of different cultural groups was desirable, the Service sent Dr. Lawrence Kolb to Europe in 1928 for the dual purpose of making special studies of these groups and of indoctrinating Service officers in the techniques of examinations already available.

Prospective immigrants were then being examined at certain American Consulates in Europe. Applicants for immigration visas came to the consulates by appointment and were examined in a favorable environment without the hurry incident to the confusion so often associated with immigration inspections at the port of arrival in the United States. Competent interpreters were always available.

Dr. J. Davis Reichard was in charge of Service activities in Warsaw, Poland, in 1928. He made observations on test ability of aliens applying for visas in Warsaw and published a guide of special value for the examination of Polish immigrants.

Dr. Kolb carried on his studies in Dublin, Ireland; Southampton, England; Cologne and Stuttgart, Germany; Naples, Italy; Oslo, Norway; and Stockholm, Sweden. During a period of three years, 1928-1931, more than 3,000 persons were examined. To insure uniformity of technique and interpretation, all of the examinations were made by Dr. Kolb personally with the aid of an interpreter when necessary.

In order that the groups examined in different countries would be fairly uniform as to education and relative social environment, no person was examined who had more than the usual common school education. Beyond the exclusion of persons with higher education, there was no selection. Persons were picked out at random and given the special examination. They represented a fair cross section of immigrants without higher education who applied during the three-year period for immigration visas.

Because of the language difficulty no tests were employed that required the subject to use verbal constructions in the solution of them. It was necessary to give instructions for all of the tests and these were given in the language of the subject and with elaborate detail so that he would understand what was required of him.

Four fairly comprehensive tests and a number of miscellaneous tests were used. The four comprehensive tests were: The Ferguson Form

Board Test; the Porteus Maze Test (adult mazes not used); the Pintner Non-language Test; the Kohs Block Design Test—used only in Italy, Ireland, and Germany.

Except in Italy and Germany where a few children were examined the study was confined to persons above 15 years of age. The selected ages were from 15 to 45, but in Italy an older group was also examined in order to measure the deterioration in test ability of illiterate or near illiterate people that is caused by advancing age. In addition, a group of 100 illiterate or near illiterate Italian mothers together with their own literate children were examined, the idea being that if the children did as well as the mothers, the poor showing of the mothers could be discounted in part on the basis of illiteracy.

RACIAL AND AGE DIFFERENCES

Showing that allowances must be made for environment and education, the median test age of literate South Italian men (age 15-44) obtained by averaging their scores on the Ferguson, Porteus, and Kohs tests was 2.75 years higher than the test age of literate Italian women, and 4.85 years higher than that of illiterate women of the same age and from the same general locality. The interpretation of these results was made easier by the test results of the literate children of the illiterate mothers. These children with a chronological age of only 9 1/3 years did as well as their mothers and had an intelligence quotient as high as that of the literate men. The studies in Italy also showed that applicants beyond 45 years of age, but not senile, had suffered a six months' deterioration in test ability.

There was considerable difference in the test age of men and women in Ireland, and a slight difference in other countries. It was concluded that the differences were environmental and that allowances should be made for them.

A group of German children scored with considerably higher intelligence than German skilled workers except on the Ferguson Form Boards.

The test ability of groups studied in different countries showed remarkable differences even though the groups compared were in some important respects similar, namely, they were all literate and none had more than a common school education. On the Ferguson Form Board,

Pintner Non-language, and Porteus Maze Tests, the 10 percentile of the highest testing national group did as well as the 90 percentile of the lowest testing national group of the same sex, and on the Pintner Non-language there was a difference of 6.38 years in test age between the highest and lowest test groups. These differences were in part due to more and better schooling that members of some groups had received. The reading test and the school history of each case showed this.

In order to eliminate as far as possible the variables due to schooling and environment, groups of literate male skilled workers in five countries were given the Ferguson Form Board Test which was presumably equally fair to all of them. The difference in test age between the best and worst national groups was found to be 3.5 years. This could have been due in part to the emigration from some countries of a more intelligent section of the population.

RESULTS OF STUDIES

The work as a whole showed:

That the ability to do even simple non verbal tests is affected markedly by schooling and environment;

That people with equal native ability from the same national and practically the same social background, but with differences based on schooling and environment, may differ as much as 4.85 years in test ability;

That the tests favored children over adults;

That the tests favored men over women, especially in groups with a poor educational background;

That persons beyond 45 years of age had deteriorated in test ability;

That there was a difference in the test ability of the national groups tested, based partly on differences in education and cultural background and possibly to some extent on selection.

From the study it was definitely concluded that in evaluating native intelligence, no test standard developed for one group can be applied to individuals of another group, but that each individual tested must be evaluated on the basis of the numerous factors covered in the study. This principle is now being followed by Service officers engaged in the examination of immigrants.

Some of the results of Dr. Kolb's study have been published in the Proceedings of the 56th Annual Session of the American Association for the Study of the Feebleminded, Philadelphia, Pennsylvania, May, 1932. Some tables showing other results of the study are published in the Manual for the Mental Examination of Aliens, U. S. Public Health Service, 1950.

Continuous Caudal Analgesia

The pain of childbearing has long been of concern to those attending women in labor. The introduction of ether and chloroform as anesthetics prepared the way for present-day anesthesia in obstetrics.

In October 1941, at the Marine Hospital at Stapleton, Staten Island, Dr. Robert A. Hingson, working with Dr. James L. Southworth, developed and first used continuous caudal analgesia. Doctor Hingson's intense interest in improving methods of anesthesia in obstetrics was augmented by the fact that his wife was in the early stages of her first pregnancy at that time. The continuous caudal method was first employed at Stapleton for the relief of pain during several surgical operations on the lower extremities of patients. Its initial obstetrical application was carried out in this hospital by Doctor Hingson, working with Dr. Waldo B. Edwards, in January 1942.

In 1940, Dr. William Lemmon in Philadelphia developed the use of continuous spinal anesthesia. The method developed by Doctor Hingson, working with Southworth and Edwards, combined the advantages of the continuous method with the safety, simplicity, and effectiveness of an extra dural nerve block by using the sacral notch approach to the sacral canal and the space around the spinal cord.

Doctors Hingson and Southworth found that a continual anesthesia of the lower part of the body and the lower extremities could be produced in the surgical patient by means of adding serial doses of an anesthetic solution through an indwelling needle within the canal of the sacral bone which was attached by means of rubber tubing to a syringe, three-way valve, and a reservoir bottle.

After having demonstrated the usefulness of this procedure as a method for the control of pain in 20 surgical operations, Doctor Hingson,

working with Doctor Edwards, sought to perfect this technique for the control of pain in obstetrics.

This was a particularly fortunate time to undertake the development of a new method of anesthesia for obstetrics. The acceleration of defense activities had greatly increased the personnel of the Coast Guard. A number of Coast Guard dependents were being hospitalized at the Marine Hospital in Stapleton, among them an appreciable number of women for delivery. In fact, the large number of Coast Guard dependents in the New York area had made it necessary to establish a small Obstetrical and Gynecological Service at the Stapleton Marine Hospital, with Dr. Waldo B. Edwards in charge.

Doctors Hingson and Edwards had already delivered patients under a form of spinal anesthesia, technically known as lumbar epidural anesthesia. They attempted to insert the ureteral catheter into the space around the lower part of the spinal cord through a 13-gage needle. Their first two cases resulted in anesthesia on only one side. They were aware of the stress and strain that would be placed upon a stiff needle that would remain in place during labor. Subsequently, Doctor Hingson and Doctor Southworth, using Dr. Edward B. Tuohy's curved point needle and a plastic catheter, developed continuous peridural anesthesia for surgery and cesarian section.

A less bulky and more malleable stainless needle was developed at their request by a manufacturing company. This needle was constructed without a hub and was built to fit snugly into the lumen of a two millimeter tube. Various local anesthetic agents in different vehicles were used in attempts to find the most effective one in the most favorable concentration. Metycaine, procaine, and pontocaine were used at various times.

This form of anesthesia is effective because of the fact that the anesthetic is applied to the sensory nerves of the spinal cord and does not affect the motor nerves. Hence, the patient is in complete possession of her faculties yet feels no pain because of the contractions of the uterus. As an increasing number of deliveries were made by this method, various improvements in procedure and technique were developed.

Doctor Hingson discussed the method that had been developed at several medical meetings. Finally, he induced Dr. Norris W. Vaux and

Dr. Clifford B. Lull of Philadelphia to allow him to demonstrate the procedure to them. Accordingly, he went to the Philadelphia Lying-in Hospital and demonstrated the method on a number of cases. Doctors Vaux and Lull were so impressed by this technique that they invited Doctor Hingson to come to that hospital and work with them in perfecting this form of anesthesia.

Surgeon General Parran, recognizing the importance of permitting further study in this field, approved the assignment of Doctor Hingson to the Philadelphia Lying-in Hospital in 1943, where he remained for two years improving the methods used in this type of anesthesia for obstetrics, and at the same time conducting classes for the instruction of physicians and nurses. Although this was during World War II, 600 physicians came to Philadelphia from all parts of the United States to take this instruction. A number of foreign physicians, particularly those from countries not at war, also came to Philadelphia to learn this new method.

Continuous caudal analgesia is one of the important contributions to the anesthesia of obstetrics. Other methods of anesthesia along the same general line, such as the so-called "saddle block," have later been developed by other workers in this field.

In 1945 Doctor Hingson was assigned to the School of Medicine of the University of Tennessee at Memphis, where for two years he worked with the Department of Obstetrics as Professor of Anesthesia in further developing and demonstrating the use of this method of anesthesia. While at Memphis he continued to hold classes of instruction. Six hundred and fifty physicians from many States and a number of foreign countries visited Memphis and there received instruction in the two-weeks' course of training devised to familiarize physicians and nurses with the technique of continuous caudal analgesia.

The method continues to be in extensive use throughout the country. It is estimated that as of the middle of 1950 more than 750,000 mothers have been delivered under this anesthesia. The major advantages so far confirmed are the protection of the premature baby from narcosis and extreme pressures of delivery, the development of pain relief especially suited for patients with cardiac, respiratory, metabolic diseases,

and in the management of eclampsia. Thus far, more than 250 papers in the medical literature in six languages have attested its merit.

At the present time, Doctor Hingson is continuing his researches on assignment to the John Hopkins University Medical School.

Sulfones in the Treatment of Leprosy

In 1941 Dr. Guy H. Faget* of the Public Health Service introduced the use of sulfones in the treatment of leprosy. This has proved to be the most important advance in the treatment of this disease that has been made since its recognition as a clinical entity.

The name Faget has been well known in medical circles in New Orleans for many years. During the yellow fever epidemics of the 1880's, Dr. Charles Jean Faget was a prominent medical practitioner in that city. It was he who first described an important diagnostic point in yellow fever (Faget's sign)—the fall in pulse rate with a rise in the temperature curve or its maintenance at the horizontal. He worked with the Marine Hospital Service during several epidemics. Three of his grandsons entered medicine, and all of these—Dr. Frank M. Faget, Dr. Guy H. Faget, and Dr. Edouard B. Faget—came into the Public Health Service. They received their medical training at Tulane University Medical School. Tradition in the southern States has it that only graduates of medical schools in New Orleans and Galveston really know clinical leprosy. There is probably a modicum of truth in this as, prior to the location of the College of Medicine of Baylor University at Houston, Texas, in 1944, Tulane University, Louisiana State University and the University of Texas were the only medical schools where students usually saw active clinical cases of leprosy during their course of instruction.

Subsequent to Dr. Guy H. Faget's appointment in the Public Health Service in 1922, he had various assignments at the several Marine Hospitals, including three or four years at Fort Stanton, the Service

*Dr. Guy H. Faget was born in New Orleans, Louisiana, on June 15, 1891, and died at the Marine Hospital in New Orleans, July 17, 1947. He received his medical degree from Tulane University in 1914. One year immediately following his graduation was spent as an intern in the Marine Hospital of the Public Health Service at New Orleans. He took additional training at the Presbyterian Hospital in New Orleans for a year. The next six years were spent as a physician for the United Fruit Company in British Honduras. While there he had the opportunity of observing various tropical diseases including leprosy.

(From USPHS Records)

Dr. Guy H. Faget

(J. P. Harris, Carville, Louisiana)

U. S. Marine Hospital (National Leprosarium), on bank of Mississippi River, Carville, Louisiana.

tuberculosis hospital in New Mexico. In 1940, he was placed in charge of the National Leprosarium at Carville, Louisiana. During his early days at Carville, he noticed in the medical literature articles regarding the use of the sulfonamides in the treatment of certain bacterial infections. Some of these drugs were reported, according to observations on laboratory animals, as being effective against tuberculosis. Because of his experience with tuberculosis, Doctor Faget was well aware of the several striking points of similarity between leprosy and tuberculosis. He therefore believed it would be worth while to try out sulfanilamide with the thought that it might prevent or clear up secondary infections in leprosy patients.

In 1940, after discussing the matter with the medical staff at Carville, he asked for volunteers among the patients to receive sulfanilamide. Nine persons were selected, eight men and one woman. They were given several courses of the drug, principally with the idea of seeing whether the secondary, or pus infections could be improved. The ulcers on the legs and other parts of the bodies of some of these patients were quite distressing and required dressing sometimes more than once daily. Any treatment that would alleviate the pus infection present would make the patients much more comfortable and might favorably influence the course of the disease.

There was little change in any of the volunteer cases for four or five months. Some of them became quite discouraged. Finally, however, after several of the patients had received sulfanilamide for more than six months, there began to be a rapid improvement in the ulcers, and shortly after that an almost miraculous clearing up of many of these ulcers that had been present for years. Before this point was reached, there were many days of discouragement, and on several occasions the experimental trial of sulfanilamide was almost discontinued.

In 1942, after about two years' experience with the sulfanilamide treatment, Doctor Faget published his first report (Public Health Reports 57: 50, 1892-1899, December 11, 1942). As indicated above, sulfanilamide was the sulfa drug used in the first series of cases. Later, promin, a related drug of the sulfone series, was used, with even more success. Diasone, sulfetrone, and promacetin have all been used subsequently with encouraging results. While some of the sulfone derivatives

are of comparatively low toxicity, they cannot be considered entirely innocuous. All the sulfones used in the treatment of leprosy are derivatives of diamino-diphenyl-sulfone, and it is probable that this common radical is the active principle. This has stimulated research for a form of the drug that would have the lowest possible degree of toxicity and the highest efficiency in the treatment of the disease. Promin had the disadvantage of having to be administered by intravenous injection. The other sulfones are administered orally in tablet or capsule form.

With the introduction of penicillin, streptomycin, and other antibiotics, it was natural that they also should be tried in the treatment of cases of leprosy. These drugs were given extensive trial at the hospital at Carville but did not prove to be any more effective in the treatment of leprosy than the sulfones.

The early work by Doctor Faget and his co-workers was done during World War II while there were restrictions on the manufacture and sale of drugs, and other attendant difficulties. As soon as the fighting was over and medical publications began to be distributed more freely throughout the world, the encouraging results secured by Doctor Faget and those working with him soon became well known. As the supply of sulfones became available for sale in foreign countries, the use of these drugs for the treatment of leprosy was undertaken in almost all of the areas where that disease is prevalent.

The results from practically every area where the sulfones were used have been satisfactory. A medical journal published in Great Britain recently stated: "The introduction of the sulfone treatment by workers of the Public Health Service began a revolution in the treatment of leprosy, whose magnitude is only now becoming apparent." Later work by observers throughout the medical world have confirmed and corroborated the value of the sulfone drugs in the treatment of leprosy. There are, however, still many problems about the use of these drugs that must be worked out. Although the clinical symptoms of the disease, particularly the ulcers and other disagreeable manifestations, improve quickly, cases remain bacteriologically positive after months of treatment. Even so, promin, diasone, and other members of the sulfone family have brought new hope to leprosy sufferers everywhere.

Introduction of Penicillin in Syphilotherapy

Dr. John F. Mahoney's name, in the minds of most persons is and will perhaps most often be connected with his preliminary study in 1943 on penicillin in syphilis—and rightly so. He made a tentative prediction then that "Should more extensive and prolonged experience confirm the impression which is to be gained from the pilot study, a rebuilding of the structure of syphilis therapy may become necessary." The rebuilding did indeed become necessary, bringing with it an era of medical progress in venereal disease that has surpassed the one introduced by Ehrlich with the arsphenamines.

Doctor Mahoney's interests and talents in the wide field of syphilology became apparent early in his medical career. Following his internship, he entered the U. S. Public Health Service in 1917. One of his first tours of duty was concerned with the incidence of pulmonary tuberculosis among coal miners of the southern States. He was next assigned to work abroad on the medical aspects of immigration and in his spare time he visited and studied in the laboratories and clinics of the leading syphilologists of European countries. Returning from his tour of immigration duty in Europe in January 1929, he was appointed Clinical Director and Executive Officer of the U. S. Marine Hospital on Staten Island, New York. A large portion of his time was given over to experimental research in syphilis in the Venereal Disease Division laboratory which had begun operations in 1927 in a single room of the Marine Hospital.

In August 1929, Doctor Mahoney assumed direction of the laboratory (later renamed the Venereal Disease Research Laboratory) at Staten Island, and under his guidance the scope of investigative work gradually encompassed a multiplicity of scientific problems, from basic biology to applied research. In the beginning, the program centered almost entirely on experimental animal syphilis, but the laboratory gradually was enlarged to include investigative efforts directed toward the solution of fundamental scientific questions concerned with the several venereal diseases, toward the clinical evaluation of treatment methods, and to control work in the serum diagnosis of syphilis. The latter activity

eventually reached into the majority of countries of the Western Hemisphere, as well as into all of the States and territories of the United States. Shortly after World War II, Doctor Mahoney's remarkable skills and leadership were internationally recognized by his appointment to the chairmanship of the Expert Committee on Venereal Infections of the World Health Organization.

Doctor Mahoney's work on the application of penicillin to syphilotherapy has been only one of his many contributions to venereal disease research. He and his associates of the Venereal Disease Research Laboratory have long served as the working nucleus of a national movement for developing uniform and improved serologic techniques; for basic research and training in serology; and for evaluation studies, surveys, distribution of standard materials, and other functions concerned with national and world-wide elevation of standards of serologic performance. Doctor Mahoney has also gained the respect and admiration of fellow scientists and co-workers for his imaginative contributions to studies on the artificial cultivation and life cycle of the virulent *Treponema pallidum;* extensive syphilis prophylactic experiments on animals; a carefully controlled gonorrhea prevention study in human beings; the development of a delayed darkfield examination technique; and the further development and application of antibiotics. Prior to the introduction of the antibiotics, he did outstanding work on the use and action of the arsenicals, bismuth, and sulfonamides.

In 1943, penicillin was available only in limited amounts and its clinical trial was thus confined largely to the pyogenic infections. Doctor Mahoney, Dr. Richard C. Arnold, and their co-workers at the Laboratory grew the mold and obtained enough of the antibiotic to demonstrate its spirocheticidal activity in animal experimentation. The results were sufficiently encouraging to induce a human pilot study, initiated in June 1943, with penicillin obtained through war procurement agencies. Four male patients with darkfield-positive primary syphilis received intramuscular injections of 25,000 units of amorphous penicillin at four-hour intervals, night and day, for eight days, or a total of 1,200,000 units. In October 1943, after a series of careful darkfield, serologic, and clinical examinations on these patients, Doctor Mahoney reported before

(Blackstone Studios, New York City)

Dr. John F. Mahoney

the annual session of the American Public Health Association that penicillin apparently possessed powerful antisyphilitic properties and, as an added advantage, promised nontoxicity combined with brevity of administration to an exceptional degree.

Fortunately, all the procurement and investigative forces of organized study, engendered by war, were available to confirm and adapt these findings. By 1944, the output of penicillin reached mass-quantity levels, but only after millions of dollars, invested by Government and by private manufacturers, had been poured into the all-out effort. Under the general auspices of a Penicillin Panel appointed by the Subcommittee on Venereal Diseases of the National Research Council, the Army, Navy, and Public Health Service cooperated with the Office of Scientific Research and Development in an extensive study of the effect of penicillin in syphilis and gonorrhea. The whole story of penicillin, from its discovery by Fleming to its present-day refinement and application, plus that of other antibiotics, is one of the most stimulating chapters in the history of medical progress.

Six years later, in 1949, Doctor Mahoney and co-workers reported once more on the long-term progress of these first four patients to receive penicillin for early syphilis. The findings after 72 post-treatment months completely confirmed the effectiveness and safety of penicillin, as have the extensive coordinated studies which were motivated by Mahoney's original report. These continuing studies, carried out at the Venereal Disease Research Laboratory and at many other Public Health Service installations and cooperating institutions, have dealt with many factors: the progressively refined and improved preparations of penicillin itself; the optimal time-dose relationship for the drug; the differentiation between reinfection and relapse; the application of chemotherapy to the various stages of syphilis and to certain inconstant factors in the host; and the biology of the causative organism of syphilis. The efficacy, safety, and simplicity of penicillin therapy in syphilis and gonorrhea have been of inestimable value to the national control program, not only medically but also administratively.

The revolutionary and progressive changes which penicillin brought about in the field of venereal disease control can be fully understood and appreciated perhaps only by the veterans in this phase of public health.

Doctor Mahoney is one of those veterans, and his contributions have been honored and will be long remembered. In addition to his chairmanship of the World Health Organization Expert Committee on Venereal Infections, he is also chairman of the National Advisory Serology Council, a member of the National Research Council, and member and fellow of other medical and scientific societies and organizations here and abroad.

In December 1949, Doctor Mahoney retired from the Public Health Service, to accept the position as Director of Laboratories, New York City Health Department. A few days later he was appointed Commissioner of Health for the City of New York.

Hygiene of Housing

The hygiene of housing in this country is still in its formative stages. Health department work usually includes programs designed to effect improvement in dwelling factors specifically related to disabling conditions—such as water supply and typhoid fever; ventilation, sunlight, overcrowding, and tuberculosis; delapidation and accidents—but those departments undertaking an intensive attack on the dwelling as a whole, and in particular motivated toward the positive aspects of housing and health, are still a small minority.

Probably the most significant contribution of the Public Health Service in this field has been its effort toward demonstrating the determinative role of the dwelling in the human environment. Health departments must devote their limited resources to those programs which will give the greatest return in health for each dollar and man-hour invested. Therefore, one of the greatest needs has been for precise knowledge of the relation between housing and health. When this intricate complex is worked out State and local health authorities can render the most valuable service in the improvement of housing and its environment.

EARLY ACTIVITIES

The relation between shelter conditions and certain specific diseases has long been recognized. Pioneers such as Gerritt Forbes, John H. Griscom, and Lemuel Shattuck in this country were seeking housing

improvement a century ago for health reasons, and Lawrence Veiller campaigned for tenement house reform prior to 1900 on the basis of health. As early as 1908, in connection with an outbreak of plague, the Service cooperated in a survey of all premises in the city and county of San Francisco, and followed it up by the ratproofing of deficient structures and the improvement of both domestic and industrial refuse disposal. Environmental health programs are closely related to the hygiene of housing for they involve inspection, health education in the sanitary maintenance of home and water supply, the construction of sanitary privies, house screening in malarious areas, and the establishment of permanent county health organizations to consolidate and continue gains achieved.

Shelter hygiene is an important part of industrial health work. As previously noted in an investigation of working conditions in the New York City garment industries in 1913, directed by Dr. Joseph W. Schereschewsky of the Public Health Service, a high incidence of tuberculosis and other illnesses among the garment workers was found to exist, together with bad lighting, ventilation, and sanitary and rest facilities in the factories and work rooms. The findings in this and other field investigations led Doctor Schereschewsky—soon joined by C. E. A. Winslow, James E. Ives, and Leonard Greenburg—to initiate in 1915 at the Hygienic Laboratory studies in illumination and ventilation and to determine the correlation between working conditions and employee health, and to develop much needed standards. These studies were continued and produced such important contributions to healthful housing as the study on daylight in buildings by James E. Ives, Frederick L. Knowles, and Dr. Lewis R. Thompson, and also that by Ives on lighting for low-cost housing.

Clearly the Service had at an early date an appreciation of the fact that shelter conditions affect health. It is worthy of note that Surgeon General Walter Wyman, as early as 1906, urged that the Service be authorized to undertake sanitary inspections of all government offices and workrooms in the Washington area. Executive Order No. 1498, dated March 15, 1912, was issued authorizing the Public Health Service to make these inspections.

LATER DEVELOPMENTS

In the midst of a tremendous recovery effort following the economic depression of 1929, the serious question arose: Shall there be Federally supported public housing and slum clearance, and if so, how much? Surgeon General Hugh S. Cumming stated in 1934 the position of the Public Health Service:

> The United States Public Health Service wishes to endorse strongly a program which will further the demolition of slum areas and the construction of low-cost housing. Reduction of mortality and sickness rates in the future will rest to a great degree in extending to the total population the health standards of the more favored groups. One necessity is that a sanitary, healthful environment be available . . . I confidently believe [the ultimate effect] would be enormous.

In 1931 the Service participated actively in the President's Conference on Home Building and Home Ownership. A report submitted to the Conference, prepared by Drs. Joseph W. Mountin and Joseph O. Dean, and Sanitary Engineer Vincent B. Lamoureux, summarized existing knowledge of the correlation between housing and health and human shelter needs and urged that research be undertaken.

An article by Senior Statistician Rollo H. Britten, "The Relation Between Housing and Health," appeared in the *Public Health Reports* for November 2, 1934. This article was a very forceful marshalling of the available facts in this country and contained a summary of convincing studies which had been recently conducted in England.

THE NATIONAL HEALTH INVENTORY

In 1935 a grant to the Service from emergency relief funds of $3,450,000 made possible the definitive survey of health in the United States under depressed economic conditions. This survey, under the direction of Principal Statistician George St. J. Perrott, included a chronic disease survey, one of the purposes of which was to determine "the relation between disease and certain environmental factors such as income, education, and housing conditions. . . ."

The results of the National Health Inventory of course did not answer all the questions concerning the causal relation between housing and health. The data did demonstrate conclusively that housing is a factor in bad health; and that a correlation exists between poor health and

overcrowding, and between poor health and unsatisfactory toilet facilities even among families with equal economic resources. Even though the survey did not reduce the relationship to a mathematical law, it brought together a mass of evidence against the overcrowded conditions which were found in 83 urban communities in 18 States.

THE WAR AND AFTER

In 1937 the U. S. Housing Authority was established. The authorizing legislation stated:

> . . . slums, blighted areas, or unsafe, insanitary or overcrowded dwellings, or a combination of these conditions. . . . are inimical to the general welfare of the nation by encouraging the spread of disease and lowering the level of health, morale, and vitality of large portions of the American people.

Housing and health were becoming associated organizationally. Mr. Joseph M. Dalla Valle, a sanitary engineer who had been closely associated with the work of hygiene of housing of the Service, was detailed to the U. S. Housing Authority in 1938 in a consultant capacity. The wartime housing crisis brought on by mass population shifts produced large-scale Federal emergency construction, often under necessarily poor site conditions. Messrs. Rollo H. Britten, statistician, M. Allen Pond, sanitary engineer, and others were assigned to the Federal Public Housing Authority in 1942. Additional engineers later assisted the Authority in avoiding health hazards in the emergency war housing program until the summer of 1946.

Many public health workers are now alert to their housing responsibilities. "Hygiene of housing" programs have been started by more than a score of local health departments, and at least 10 of these are actively engaged in housing law enforcement programs to improve the quality of existing substandard housing. The American Public Health Association has devised an objective and easily administered technique for appraising the quality of housing which has been used by over 30 local governments as a basis for planning community housing programs. Since 1948 the Communicable Disease Center has assisted State and local authorities in taking advantage of this appraisal technique by offering training courses in its use.

Early in 1948 Surgeon General Leonard A. Scheele assigned the responsibility for the hygiene of housing activities to Senior Sanitary Engineer M. Allen Pond. In January 1949, Sanitary Engineer Ralph J. Johnson was assigned to work full time on hygiene of housing problems. In February 1949 Surgeon General Scheele presented a statement before a Subcommittee of the Committee on Banking and Currency of the United States Senate, Eighty-First Congress, First Session, strongly endorsing housing legislation which was enacted into law that year and became known as the Housing Act of 1949. In May 1949, Surgeon General Scheele and the Housing and Home Finance Administrator signed a Memorandum of Understanding recognizing their mutual interest in, and responsibility for, improving housing and community conditions in the name of the health and safety of the American people. In 1950, the Public Health Service provided hygiene of housing consultative service to State and local health departments to aid those jurisdictions in preserving and improving the quality of existing housing, and in raising the level of substandard housing to minimum health needs.

Topically Applied Fluorides

An important duty of the Public Health Service is to develop more effective measures for the prevention, treatment, and control of diseases. An example of work in this area is that of Dr. John W. Knutson and his associates in the development of the topical fluoride method for partially controlling dental caries.

On the basis of epidemiological and laboratory evidence, the hypothesis was formulated that dental caries could be reduced by the topical application of fluoride solution to the teeth. This hypothesis was first tested by Drs. Basil G. Bibby, V. D. Cheyne, and John W. Knutson, working separately. Early in 1942, Doctor Knutson, in collaboration with Dr. Wallace D. Armstrong, Professor of Physiological Chemistry, University of Minnesota, selected three Minnesota towns—North Mankato, Arlington, and St. Louis Park—for testing clinically the effectiveness of a two percent sodium fluoride solution. Three hundred and thirty-seven children, all between seven and 15 years old, participated in the study. The solution was applied to the teeth in the upper left and

lower left mouth quadrants. The teeth on the right side of the mouth were not treated and served as controls. Some of the children in this initial study received as many as 15 applications, others received seven applications. Three hundred and ninety-two children in the same schools did not receive applications and served as additional controls.

About a year after the fluoride solution had been applied, the teeth of the children were reexamined. There were approximately 40 percent fewer new carious teeth in the treated than in the untreated teeth of the children who received the applications. The teeth of children who did not receive the applications and who served as a control group, showed an incidence of caries similar to that of the untreated mouth quadrants of the children who received the applications. This finding indicated that the carious inhibiting effect was local and was limited to those teeth receiving topical applications of fluoride.

Numerous additional clinical studies were conducted to determine the effect of omitting the dental prophylaxis before the series of fluoride applications to determine the relative effectiveness of a varying number of applications, to examine the effect of spacing the series of applications at different time intervals, and to provide data on the caries inhibiting value of different fluoride solutions when applied topically to the teeth of children. Among these studies, those conducted at Troy and West Milton, Ohio, indicated that four applications of a two percent solution of sodium fluoride preceded by dental prophylaxis gave the maximum reduction in caries incidence.

It was recognized that, as with other public health measures, cost and adaptability to mass procedures were of great importance. Thus, concurrently with the clinical testing of topically applied fluorides, special efforts were made to develop a procedure that would enable one to treat children rapidly while following the simple, though precise, application technique. These efforts led to the development of what is now known as the multiple chair procedure, and the utilization of dental hygienists for making the applications. Each operator is provided with four ordinary chairs placed one behind the other. Equipment and supplies are conveniently arranged on a long narrow table near the chairs. As the operator moves back and forth along the line of children seated in the four chairs, the equipment and supplies are always within easy

reach, thus enabling her to utilize her time efficiently. Through this procedure the time required to treat the teeth of each child has been reduced to approximately one-third of that required when operating on an individual patient basis.

As soon as the effectiveness and practicability of topical fluorides had been proven, a second major duty of the Public Health Service was brought into focus. This is to assist States, counties, health districts, and other political subdivisions of the States by demonstrations in establishing and maintaining adequate measures for the prevention, treatment, and control of dental caries.

In 1948, Congress made $1,000,000 available to the Public Health Service for a nation-wide topical fluoride demonstration program. This program was to be conducted in close cooperation with State health departments, dental societies, and public organizations. It was designed to publicize the topical fluoride application procedure and to demonstrate how community topical fluoride programs might operate. The major function of the program is to stimulate the establishment of community facilities that will bring the benefits of this preventive measure to all children. This work is currently (1950) being carried forward under the direction of Dr. John W. Knutson, Chief of the Division of Dental Public Health.

Communicable Disease Center

GENERAL SCOPE OF ACTIVITY

One of the newer important segments of the Public Health Service is the Communicable Disease Center, with headquarters at Atlanta, Georgia. Its chief function, as the name implies, is concentrated attack upon the infectious and parasitic diseases. Major effort is directed toward improvement of control methods. This is accomplished through reexamination of current administrative practices in the light of newly developed or revised techniques and aggressive application of new knowledge and procedures. The Center conducts a continuous program of research and development of new techniques and materials needed for total war against communicable diseases. This includes experimentation with a wide variety of equipment, drugs and other chemicals,

with highly differentiated laboratory tests, and with biologicals and related products. The character of this research differs from that of the National Institutes of Health in that the Institutes are concerned with fundamental research, whereas the Center focuses attention upon practical and applied research; studies in operational programs and methodology—in other words, how to do things best.

The staff of the Communicable Disease Center comprises teams of highly specialized and widely varying professional talents including physicians, engineers, veterinarians, microbiologists, entomologists, epidemiologists, pathologists, chemists, and biochemists. They collect and appraise scientific facts about diseases and then translate this knowledge into practical methods of control. These methods, in turn, are proved through field testing after which they are demonstrated to State and local health agencies.

The Center furnishes epidemic and disaster aid to State and local health agencies. In this capacity, it helps the agencies investigate and control epidemics and stands ready to restore sanitary facilities and to control disease in the event of floods, hurricanes, explosions, and other disasters. In short, one of the Center's distinguishing characteristics is its instant preparedness to apply new knowledge and techniques to the control of communicable diseases under either normal or emergency conditions.

UNDERLYING PURPOSE

The Communicable Disease Center owes its beginning to the strong conviction of Dr. Joseph W. Mountin that a need existed in the Public Health Service for decentralizing highly specialized knowledge. Its development has been strongly influenced by insistence that the Center remain unfettered by the restrictions commonly associated with governmental organization. It was recognized through practical experience and close acquaintance with the States and their problems that the kind of Public Health Service assistance needed most by State health agencies was specialized, technical competence not represented on their own staffs—a specialization above and beyond that which they could afford on a full-time basis for ordinary day-to-day operations.

The Communicable Disease Center, an example of such special assistance, is an outgrowth and further development of the Office of Malaria Control in War Areas established in Atlanta, Georgia, during World War II. The objective of this Office was to control malaria in areas contiguous to military reservations and major war production installations. Here, under the direction of Dr. Louis L. Williams, Jr., a variety of professional and technical personnel especially trained in the several phases of malaria control was brought together. Control projects were operated by State health departments through State offices of Malaria Control in War Areas. In general, activities were restricted to 15 southeastern States, California, Hawaii, and the West Indies.

With cessation of hostilities, control operations were re-oriented and emphasis was shifted from specialized projects in war areas to more general communicable disease problems affecting the nation as a whole. Returning servicemen, occupation troops, and greatly expanded global air traffic constituted a continuing source of exotic infections. Moreover, marked progress had been made in bringing disease-bearing insects and rodents under control, thus permitting a redirection of the original program.

In line with its expanded activities, the name of the Office of Malaria Control in War Areas was changed to the Communicable Disease Center on July 1, 1946. Headquarters remained in Atlanta. The staff and organization of the Office of Malaria Control in War Areas formed the nucleus of the Communicable Disease Center. The Center as it exists today has evolved through a gradual transition in scope of activity, enlargement of staff, and revision of organizational structure. One important phase in the reorientation process has been the provision of training in methods of communicable disease control for students and scientists from abroad and for Service officers being assigned to duty in foreign countries. Primarily, however, the Center was established to serve the State health departments.

From the beginning, the primary goal of the Center was to solve any disease problem presented. Any lead or particular facet that might give a definite answer was to be explored. The character, scope, and intensity of laboratory research and field investigations would be determined by the gaps in knowledge and the problems encountered in rela-

tion to the Center's mission. The newer aspects of communicable disease etiology such as viruses, rickettsiae, and fungi were to be studied intensively. Therefore, it was decided that the broadest range of talent obtainable should be available within the Center.

The Center's first concern was that group of diseases in which insects and animals are known or suspected to be sources or vectors of infection. Specific diseases selected for concentrated and coordinated attack—leading eventually, it is hoped, to eradication—were malaria, murine typhus, and rabies. Other diseases dealt with intensively include dysenteric-diarrheal diseases, the viral encephalitides, poliomyelitis, Q fever, brucellosis, creeping eruption, histoplasmosis, salmonellosis, and tularemia.

The coordinated approach, which the Center has featured, called for a wide variety of professional disciplines. More advanced laboratory services than are routinely available in State health departments were needed. These included competence in parasitology, virology, rickettsiology, general bacteriology, enteric bacteriology, serology, mycology, and clinical pathology. To relate these to field problems, epidemiologic, veterinary, entomologic and engineering skills were required.

ORGANIZATION AND METHOD OF OPERATION

Along with determination of the kind of services which the Communicable Disease Center should be equipped to supply arose the necessity for deciding how it should function. Should the States send their problems to the Center and have them solved there? Should personnel from the Center go out to the States? Or should groups of State personnel be brought to the Center and taught how to solve their own problems? A combination of these methods was selected.

The outstanding executive ability of Mark D. Hollis who administered the rapidly expanding activities of the Center during the period January 1944—December 1946, has had a permanent influence on the Center's organizational structure and scope of service. On January 1, 1947, Dr. Raymond A. Vonderlehr was placed in charge of the Communicable Disease Center. Under his experienced and capable guidance the predominating emphasis of the Center program has shifted from insect and rodent control operations to large scale field and laboratory

investigations designed to produce useful knowledge concerning the diagnosis, transmission, and prevention of communicable illness. Both Mr. Hollis and Dr. Vonderlehr have been assisted by Dr. Justin M. Andrews, Deputy Officer in Charge, who has given special attention to the effective direction of the Center's research program.

Major activities of the Center fall into five general classifications: (1) operation of control programs; (2) field investigations and studies; (3) laboratory services; (4) training services; and (5) aid in connection with epidemic and non-military catastrophies.

Operational control programs are established collaboratively within the respective State health departments, under the supervision of the State health officers. The Communicable Disease Center joins with and amplifies the State and local health organizations by providing trained personnel, technologic information, training facilities, laboratory services, and the like. Costs of operation are borne jointly by the State or local health agency and the Communicable Disease Center. DDT residual spray programs for malaria control, domestic rat control programs for the reduction of murine typhus, and rabies eradication programs are examples of operational programs. Primarily, the role of Communicable Disease Center personnel detailed to the States has been that of furnishing technical guidance and supervision, supplying and demonstrating specialized materials and equipment, and aiding in the training of operational personnel.

Unlike operational control activities, field investigations pursued by the Communicable Disease Center personnel have been primarily direct undertakings, although many have been carried on in collaboration with State and local health departments and other public and private agencies engaged in public health work. As a rule, field investigations are made either to evaluate on a large scale laboratory-proven or suggested communicable disease control practices and techniques, or to produce information pertaining to communicable disease transmission and control not obtainable through laboratory research alone.

The objective of Communicable Disease Center laboratory services is to supplement and reinforce diagnostic facilities of State and local public laboratories and to provide technical refresher training and extension services that will enable States to improve their own laboratory facili-

ties and proficiencies. To this end, major efforts have been directed toward methodology research, with emphasis on the evaluation, improvement and development of techniques; assistance to States through processing of unusual and difficult specimens; provision of refresher and advanced training facilities for laboratory directors and technicians; evaluation of State and local laboratories for diagnostic proficiency and techniques, staffing, and equipment; and provision of general and special consultative services in various fields. The entire array of laboratory specialists available at the Center is brought into action to provide these services.

Since the beginning, the training courses for laboratory workers have been developed to give State personnel an opportunity to learn more highly specialized skills and newer techniques in a setting which contained the best equipment, most capable personnel, and the most effective educational devices available.

The laboratory diagnostic services provided by the Center were so popular with and beneficial to State and local public health laboratories that similar services have been developed for clinical pathology. The purpose of this program is improvement of medical practice through service to physicians in raising clinical laboratory medicine to a plane of the highest possible quality. A corps of pathologists, hematologists, cytologists, chemists, and physicists has been employed to provide the same degree of specialized service in the field of clinical pathology that is available in the broad area of bacteriology. Old tests are reexamined, new tests developed, and confirmatory reference tests performed on a limited basis.

Refresher instruction for laboratory personnel is only one facet of the total training services of the Communicable Disease Center. These activities were initiated in an effort to relieve the acute shortage of trained technical and professional personnel of all kinds for malaria and typhus control. Courses consisting of lectures, field work, and demonstrations were organized for malaria consultants, rodent control specialists, and insect control supervisors. New courses and facilities were added as the demand for trained public health personnel grew. The necessity for speed in training led to the production of audio-visual training aids such as motion pictures, filmstrips, slide series, manuals, and allied materials.

From this beginning, training activities of the Communicable Disease Center have developed and expanded until today their over-all objective is to conduct programs that enable public health personnel of all categories and at various levels to improve their usefulness in communicable disease control efforts. To this end, courses are offered at headquarters in Atlanta and at regional training centers maintained in various sections of the country. In accordance with requests of State personnel, training courses of the Communicable Disease Center contain minimal basic class-room instruction; most of the trainee activities consist of observation of and participation in health activities under guided supervision. These courses are open to health officers and their assistants, sanitary engineers, sanitarians, public health educators, and other types of personnel employed by Federal, State, local and other agencies primarily engaged in public health work.

In addition to the courses offered at Atlanta, regional training centers operate at Albany, Columbus, and Savannah, Georgia; Cincinnati, Ohio; Denver, Colorado; Topeka, Kansas; Buffalo, New York; Amherst, Massachusetts; Bloomington, Illinois; and Pittsburgh, Pennsylvania. Except for those at the Communicable Disease Center itself and at the Environmental Health Center at Cincinnati, training centers operate under the auspices of health departments or educational institutions. Special courses are also conducted for State and local health department personnel on a decentralized basis in other cities, as indicated by requests from trainees. States are further assisted in the development of trained public health staffs by the assignment of training officers to State health departments to help them organize and carry on their own training programs.

The demand for Center-produced audio-visual and allied training aids has become so great that special production services are necessary to keep pace with the expanded training program. The most complete and up-to-date equipment available for production of superior films, filmstrips, and slide series has been installed in the audio-visual production services of the Center and well-trained technicians in this field have been employed. A film library is maintained which lends training films and filmstrips to health agencies and schools throughout the world.

The fundamental purpose of the epidemic and disaster aid service is to furnish trained and experienced personnel, supplies, equipment, and highly specialized services needed to supplement State resources (1) in investigating and otherwise aiding with outbreaks of poliomyelitis, encephalitis, diphtheria, intestinal infections, and other communicable diseases; and (2) in furnishing assistance in the public health aspects of nonmilitary catastrophes. Progress has been made in the stockpiling of materials essential to meeting emergencies arising from disease epidemics and elemental disasters and in establishing procedures for responding quickly and effectively to State requirements for expanded aid.

Other Regional Centers

While the concept of decentralization of special Public Health Service assistance to States has most nearly reached fruition at the Communicable Disease Center in Atlanta, this one Center does not represent the full extent of regionalization envisioned in plans under consideration. The pattern developed there is a prototype which already has been transferred to two other points: the Environmental Health Center in Cincinnati, Ohio, and the Arctic Health Research Center at Anchorage, Alaska. Whereas disease considerations of a biological character have been featured at the Communicable Disease Center, the Environmental Health Center in Cincinnati has been established for concentration on the influence of physical surroundings on health. In this Center, problems of the environment are the subjects of special study. Essentially the same concept is being followed in developing the Arctic Health Research Center at Anchorage, where attention is being focused on health problems associated with low temperatures and with the social and cultural patterns peculiar to an arctic region.

Publications

The publications issued by the Public Health Service include several regular series of bulletins which serve different and distinct purposes. One series (Public Health Reports) is intended to provide health officers and the general public with information regarding the current incidence of disease in the United States and foreign countries and presents special

studies on particular diseases; one (Public Health Bulletins) deals principally with problems of public health administration; one (National Institutes of Health Bulletins) presents the reports of research activities at the National Institutes of Health; two series (Journal of Venereal Disease Information; Journal of the National Cancer Institute) relate to specific diseases—venereal diseases and cancer. The *Annual Report* reviews the operation of the Service in its various fields of activity during the fiscal year.

With the exception of the *Annual Report,* the present weekly *Public Health Reports* is the oldest of the series of regular publications. Originally published under the title of *Bulletins of Public Health,* the first copy appeared under the date of July 13, 1878. It was issued under the authority of the Quarantine Act, approved April 29, 1878, and contained abstracts of consular sanitary reports and other pertinent information regarding the prevalence of disease in foreign countries. The publication was continued under the original title until May 24, 1879 (46 numbers), when it was discontinued upon the creation of The National Board of Health. Publication of this journal was resumed on January 20, 1887, under the title of *Weekly Abstracts of Sanitary Reports* and continued under this title for nine years, until 1896, when it was renamed the *Public Health Reports.* The first issue for the calendar year 1896 (Jan. 3) carried the new and present title, and it has been issued weekly since that date. In recent years, in addition to current morbidity and mortality data, domestic and foreign, the *Public Health Reports* have included special articles on a wide variety of public health subjects of special interest to health officers and other public health workers. For many years this publication also contained abstracts of laws, ordinances, and court decisions pertaining to public health. Separates, or reprints, are issued of the important articles and of statistical data in order to provide a wider and more economical distribution of such material. Also, since 1913, *Supplements* to the *Reports* have been printed as a separate series; included in the *Supplements* are articles too long or for other reasons not suitable for the current issues. Comprehensive directories of State and local health departments have been published in this series annually for a great many years.

With the expansion of the work of the Marine Hospital Service into the fields of research and assistance to States in public health matters, the publication of articles dealing with investigations and the technical phases of public health work was necessary. Special articles on various aspects of public health work were published in the *Public Health Reports* frequently with the object of having reprints to distribute for informational purposes. Some articles were published in the *Public Health Reports* as there was no other place where they could be readily published. Before the inauguration of the series of *Public Health Bulletins,* several publications were printed as "Precis." These were usually reprints from the *Public Health Reports* and related to such subjects as smallpox vaccination, diphtheria, and other diseases of public health interest.

The original Act authorizing the *Bulletins of the Hygienic Laboratory* specified that not to exceed 10 could be published in any one fiscal year. For some years the full quota of these bulletins was published from the different divisions of the Hygienic Laboratory and from other Service sources, especially investigations conducted in the field. This series of Bulletins could not be utilized to meet fully the growing public health needs. Special reprints from them were unavailable. Some of the highly technical subjects were of no interest to scientists in other lines or to public health administrators. For these reasons there was need of a practical series which would not be influenced by limitation as to numbers of issues and which would be suitable for educational and scientific uses. Accordingly, the series of *Public Health Bulletins* was instituted in 1910 with number 32. Numbers 1 to 31 were assigned to various publications relating to public health that had been issued by the Service from 1881 to 1910. The serial numbers, therefore, do not appear on the title pages of numbers 1 through 31. The first publication of the Service dealing with scientific investigations which was later given the title of *Public Health Bulletin No. 1* was a report on "Trichinae and Trichinosis," prepared by Assistant Surgeon W. C. W. Glazier of the Marine Hospital Service and published in 1881.

This series of bulletins includes detailed discussions on a wide variety of subjects such as industrial hygiene, sanitation, surveys of health facilities, epidemiological studies and investigations, and reviews of pub-

lic health literature. The most recent *Public Health Bulletin* was No. 306, "Air Pollution in Donora, Pa." (1949).

The *Official List of Commissioned and Other Officers* was first published in 1881. That list included the names of 35 career officers, of whom the following were stationed at Headquarters: Surgeon General John B. Hamilton; Dr. Oscar Oldberg, Medical Purveyor; and Passed Assistant Surgeon J. C. Fisher. Also included in this publication were the names of 32 physicians known as Acting Assistant Surgeons. They were physicians in private practice who were employed on a part-time basis to provide medical care for beneficiaries at ports where there was not a sufficient volume of work to justify the maintenance of a full-time outpatient office or hospital. This official list of officers usually has been published annually. The most recent issue of this publication was as of September 1, 1949.

The series entitled *National Institute of Health Bulletin* was inaugurated in 1900, and until 1930 was titled *Bulletin of the Hygienic Laboratory*. These bulletins, published at irregular intervals, report the results of the technical and research work conducted in the laboratories and the institutes of the National Institutes of Health, the research bureau of the Public Health Service.

With the development of a program for the control of the venereal diseases in 1918, the publication of special articles on the subject was instituted, and in 1923 the *Journal of Venereal Disease Information* was established. This is a monthly periodical the contents of which, succinctly set forth in the title, are designed to furnish current information to health officers, private physicians, and other professional personnel regarding new methods and problems in the control of venereal diseases.

In the sanitation field, *Public Health Engineering Abstracts* was first published in 1921 in mimeographed form. In 1944, printing of it started. It contains abstracts of published material of interest to workers in sanitation, the abstracts being prepared by many cooperative contributors upon assignment of topics. Currently (1950), each monthly issue, now prepared at the Environmental Health Center, Cincinnati, contains 32 pages of material classified in accordance with various subject headings.

With the increasing emphasis on cancer as a public health problem, *The Journal of the National Cancer Institute* was inaugurated, the first

issue appearing in 1941, four years after the establishment by law of the National Cancer Institute. Each volume comprises six numbers. This *Journal* functions as a leading clearinghouse of knowledge regarding the progress being made in the many problems in the field of cancer research. It is one of the projects of the cancer education program, and the *Journal* is distributed to physicians, cancer research workers, and libraries. Papers published in this *Journal* are prepared by members of the staff of the National Cancer Institute and scientists from other institutions.

The *Annual Report* of the Surgeon General of the Public Health Service was first issued in 1872, apparently without specific authorization by Congress other than that printing funds could be used for that purpose. The first of these *Annual Reports* was made by the Supervising Surgeon General John M. Woodworth, to the Honorable George S. Boutwell, Secretary of the Treasury. It contained not only a report on the activities of the Service for the fiscal year 1872, but also a brief history of the Service. These reports have been issued annually since that date, with the exception of a few years when they covered two fiscal years of operation. The first specific authorization by law for the *Annual Report* is apparently that in the Act of February 15, 1893, which provided that such a report on the operation of the Service (shall) be made by the Secretary of the Treasury to Congress. The first specific mandatory requirement for an annual report to be made by the Surgeon General to the Congress, through the Secretary of the Treasury, was apparently that authorized by Congress in the Act of July 1, 1902, which also specified that such reports shall be "a full and complete report of the transactions of said service, including a detailed statement of receipts and disbursements."

In addition to the publications previously enumerated, the Public Health Service also issues a series of popular material for the information and guidance of the general public. These include an industrial health series, various leaflets, pamphlets, motion pictures, slides, and similar material for health educational purposes.

The authorization contained in the Act of July 1, 1944 ("The Public Health Service Act") for the publication of information for use by the public and other persons is as follows:

From time to time the Surgeon General shall issue information related to the public health, in the form of publications or otherwise, for the use of the public, and shall publish weekly reports of health conditions in the United States and other countries, and other pertinent health information for the use of persons and institutions engaged in work related to the functions of the Service.

Leadership in Research Planning

Credit for important scientific discoveries is freely given to individual scientists or groups of investigators who, through their persistent efforts, extend the borders of our scientific knowledge. In our appreciation of these outstanding, and often dramatic, accomplishments, we are sometimes prone to lose sight of those in the background who, in their administrative capacities, render valuable assistance to scientific workers such as securing appropriations, planning the over-all program, and maintaining important and necessary political and other contacts.

The interest of Doctor Wyman in scientific research was manifested at the Marine Hospital in Stapleton, New York, of which he was in charge, by establishing a research laboratory there in 1887. Dr. Joseph J. Kinyoun was associated with him and became the first director of the research laboratory. When Doctor Wyman became Surgeon General, he kept constantly in mind the importance of advancing and developing scientific research as an integral function of the Service.

The Service Reorganization Act of 1902 authorized the creation of a Division of Scientific Research. At that time scientific research did not have the prestige and glamour that now surround it. Relatively few physicians were concerned with scientific investigations. Their main professional interest was the application of existing knowledge rather than the search for new knowledge.

In 1905, Surgeon General Wyman called to Washington a young officer, Dr. John W. Kerr,* to assume charge as Assistant Surgeon General of the recently created Division of Scientific Research. He held this position until 1918. For the six years preceding Doctor Wyman's death in 1911, Doctor Kerr worked closely with him. It fell to Doctor Kerr to perform much of the administrative and detail work in plan-

*Born in Ohio, Doctor Kerr received his medical degree from Western Reserve University in 1897. He entered the Public Health Service in 1898, and was retired from active duty because of physical disability in 1933.

TREASURY DEPARTMENT,
Document No. 84.
Marine Hospital.

UNITED STATES MARINE HOSPITAL SERVICE.

REPORT

ON

TRICHINÆ AND TRICHINOSIS.

PREPARED, UNDER DIRECTION OF THE SUPERVISING SURGEON-GENERAL,

BY

W. C. W. GLAZIER, M. D.

ASSISTANT SURGEON, MARINE HOSPITAL SERVICE.

PUBLISHED BY ORDER OF CONGRESS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1881.

(From USPHS Records)

First scientific report published by the U. S. Marine Hospital Service, 1881.

(Harris & Ewing, Washington, D. C.)

Dr. John W. Kerr

ning and developing public health investigations. It was he who undertook the painstaking preparation of detailed appropriation estimates, the selection and recruitment of needed personnel, and made appearances before the Appropriations Committees of the Congress to secure the funds to carry on these field and laboratory studies. Upon him also fell the task of keeping informed on the current public health matters of pressing interest and the broad trends of the times.

A few years after Doctor Kerr was placed in charge of the scientific research program, a need arose to decide the type of publications in which the research work of the Service in public health should be published. The weekly *Public Health Reports* were intended for practicing health officers rather than scientists. The *Bulletins of the Hygienic Laboratory* (reports on scientific research) were restricted in number by law. These bulletins usually dealt chiefly with scientific and technical investigations. As a consequence, Doctor Kerr was responsible for renewal of issuance of the *Public Health Bulletins.* They now furnish a medium for reporting by the Service of important advances made in the public health field generally.

By temperament and training, Doctor Kerr was well suited for the assignment in charge of scientific research. His experience as a young officer during the first outbreak of plague in San Francisco in 1900, and his later assignment to Hong Kong, China, provided a useful background in exotic and pestilential diseases. He was an indefatigable worker, possessing a keen, analytical mind, with a strong admixture of Scottish caution and fixity of purpose. When a scientific worker developed an idea for a particular study or some type of field investigation, he would come to Doctor Kerr and discuss it. After analyzing the problem, if it seemed sound, Doctor Kerr would assure the individual of the necessary funds to undertake the project—even if at the moment he did not know how those funds could be secured.

Seldom was there a call by an important visitor which was not immediately recorded in memorandum form for ready reference in the files. Discussions held and conclusions reached were invariably dictated and placed on file for the record. A young officer who was fortunate enough to serve under Doctor Kerr's direction received lessons in meticulous

attention to detail and in the development of logical processes of reasoning that remained a valuable asset for the rest of the young officer's life.

Doctor Kerr is indeed a man of many facets—retiring, almost diffident, yet firm and staunch with full courage of his convictions; careful, and yet able to almost abandon caution when he felt the need justified it. His Scottish instinct made him a wise, skillful administrator. The outstanding leadership given by him as a farseeing planner and builder of research by the Service was of inestimable value. Certainly, the 13 years he devoted to guiding and working for scientific research paved the way for the comprehensive research program as it exists today (1950).

CHAPTER VI

Intragovernmental Relationships

Success is never final, failure is never fatal. It is work, patience, and courage that count.—ANONYMOUS

Health Problems in All Agencies

SEVERAL Federal departments and agencies have responsibilities for medical and health activities essential to the performance of their primary functions. Some authorities on management and government organization have contended that more effective and economical results could be obtained by centralizing in one agency the administration of all civilian medical and health functions. Other equally competent persons experienced in medical and health program administration hold an opposing view, deeming such concentration of authority and responsibility as inadvisable and impracticable because of the definite and disparate health problems of the several agencies.

Practically every department and major agency of the Federal Government has certain limited health functions, but the Public Health Service is the only Federal agency which has legislative authority for dealing with all Federal health functions, especially in its relation to international, State, and local health authorities.

When various branches of the Federal Government not having a medical staff wish to undertake activities that have a bearing on health or sanitation, it is logical that they should rely on the principal health agency of the Federal Government—the Public Health Service—for assistance and request the assignment of experienced personnel to take charge of the health aspects of the undertaking. This method is mutually advantageous and, taken with the other activities of the Service, results in a larger number of persons of special disciplines and experience being available from which to make selections to meet individual problems. When the work is completed, the personnel concerned are returned to the Service for utilization on other duties and assignments.

Broad authority to assign personnel from the Public Health Service to other Governmental departments and agencies upon request and to cooperate in carrying on public health activities was contained in the Act of April 9, 1930. This Act also authorized the detail of Service personnel to educational and research institutions for special studies and for the dissemination of information relating to public health.

Coast Guard

After the freedom of the American colonies had been won through the War of the Revolution, the Continental Navy was disbanded. There was then no sea force available for the protection of the coasts and the maritime interests of the newly constituted United States until the Revenue-Marine was authorized by an Act of the First Congress approved on August 4, 1790, by President George Washington.

The first commission granted by President Washington to any person for duty afloat was issued to Captain Hopley Yeaton, of New Hampshire, in the U. S. Revenue-Marine. The name was changed to U. S. Revenue-Cutter Service by Act of Congress in 1863. The Revenue-Cutter Service has operated in the Treasury Department since its establishment, except in time of war when it automatically becomes a part of the Navy. The Revenue-Cutter Service and the Life-Saving Service were consolidated in 1915 to form the Coast Guard. The Coast Guard, by law, is "a military service and a branch of the armed forces of the United States at all times." Officers and men of the Coast Guard have received medical care at the hospitals and outpatient offices of the Public Health Service for more than 150 years. Medical officers of the Service have been assigned to serve on vessels of the Coast Guard since 1879. The early assignments were in connection with special expeditions to the Arctic, Alaska, or on practice cruises of the training ships, and later on training cruises from the Coast Guard Academy. Dr. Walter Wyman, who later became Surgeon General, was one of the earlier officers to serve on a Coast Guard vessel.

The Coast Guard Cutter *Bear* was well known to many Service officers. The *Bear* was built in Scotland, her keel being laid in the fall of 1873. This vessel was constructed primarily for Newfoundland seal fishing and was especially designed for navigating through ocean ice.

In February 1884, the *Bear* was acquired by the Government and played a leading part in the dramatic rescue of the survivors of the A. W.

(Official Coast Guard Photo)

Coast Guard Cutter BEAR.

(Official Coast Guard Photo)

Formal inspection aboard Coast Guard Cutter SENECA, *1913.*

LEFT TO RIGHT: *Third Lieutenant Gustavus U. Stewart, Third Lieutenant of Engineers Mayson W. Torbet, Assistant Surgeon Carlisle P. Knight (USPHS), Captain Charles E. Johnston, First Lieutenant Phillip W. Lauriat, First Lieutenant of Engineers Michael N. Usina, Third Lieutenant Floyd J. Sexton, Second Lieutenant William P. Wishaar, Third Lieutenant of Engineers Francis E. Fitch.*

(From USPHS Records)

Dr. James G. Townsend, Public Health Service, examining eye of Alaska native, 1915. Inhabitants of many of these villages never see any physician except medical officers of the Service aboard Coast Guard cutters on their annual visits.

Greely Expedition to the Arctic, along with the Coast Guard Cutter *Thetis* and a British vessel, the *Alert*. An act of Congress approved March 3, 1885, appropriated the funds to consummate the purchase of the *Bear* by the Coast Guard.

On April 21, 1886, the *Bear* was ordered, in company with other Coast Guard Cutters, to the Pribilof Islands off Bristol Bay, Alaska, to search for the crew of the bark *Amethyst*. This was the first of annual Arctic trips that extended over a period of 39 years with only one interruption and included almost every conceivable kind of rescue, assistance, investigation, and patrol. Dr. William D. Bratton was the first of a long series of medical officers of the Service to serve aboard the *Bear*. He reported on that vessel on April 28, 1888. On numerous occasions the *Bear* was a focal point in international disputes over Alaskan water jurisdiction between the United States and the Governments of Russia and Canada. Her annual patrol, however, ceased in September 1925, and in 1929 she was decommissioned at Oakland, California.

In 1932 the *Bear* was secured by the Navy for use by Rear Admiral Richard E. Byrd and was refitted at Boston Navy Yard. She sailed September 25, 1933, and reached the Bay of Whales, Antarctica, on January 31, 1934, incidentally establishing a new record of 12 days for the 2,500-mile run from Dunedin, South Island, New Zealand. In 1939 the *Bear* began a voyage to Little America that lasted 118 days.

The *Bear* was continued in service by the Navy until June 9, 1944, when she was decommissioned. In February 1948, the vessel was sold for the Navy by the U. S. Maritime Commission to a Canadian purchaser.

Physical examinations of applicants for enlistment and reenlistment in the Coast Guard have been conducted by officers of the Public Health Service since the early 1870's. Medical examinations have also been conducted by the Service for many years for appointment, promotion, separation, and retirement of Coast Guard officers and for cadets at the Coast Guard Academy. Although these services had long been performed for the Coast Guard, it was not until the Act of April 12, 1902, that Service officers were authorized by law to serve on Coast Guard retiring boards and not until the Act of June 24, 1914, was there specific authority in law for the then long-established practice of assigning medical officers to vessels of the Coast Guard. Medical officers were first assigned to the Coast Guard Academy then located at Anne Arundel Cove, Maryland,

in 1906. The Academy was moved to Fort Trumbull, Connecticut, in 1910, where it remained until 1932 when it was moved to its present location, New London, Connecticut. Officers of the Service assigned to duty on Coast Guard vessels are authorized to extend medical aid to the crews of American vessels engaged in deep-sea fishing. Dental officers were first assigned to the Coast Guard in 1924. Dr. Joseph O. Fournier served on the *Haida* and at Unalaska during that time. The first dental officer to serve at the Coast Guard Academy was Dr. Frank C. Cady, who was assigned there in 1925.

Dr. Alf E. Nannestad, a dental officer of the Service, assisted in writing the music of the Coast Guard marching song, "Semper Paratus." In 1926, Doctor Nannestad was attached to the Coast Guard at Unalaska. While there he was assigned to the Bering Sea Patrol Force, under the command of Captain Francis Van Boskerck. For some time Captain Van Boskerck had been working on this song but had never really developed or finished it. Doctor Nannestad had a violin and a ukulele with him, and, during the six months that he was on the Bering Sea Patrol, he and Captain Van Boskerck worked together and finally completed the song. Later, after Captain Van Boskerck submitted it to the Coast Guard Academy, it was officially accepted as the Coast Guard marching song and was first used about 1928.

Officers of the Service were assigned to duty with the Coast Guard during World War I while it operated as a part of the Navy. World War II brought a tremendous expansion of the Coast Guard which again served as a unit in the Navy.

A medical officer of the Public Health Service has served at Coast Guard Headquarters as medical adviser since 1920. The Act of November 11, 1943, authorized the grade of Assistant Surgeon General for the officer of the Service assigned as Chief Medical Officer of the Coast Guard. Dr. Carl Michel was the first officer detailed under this authority. Upon his death in 1946, he was succeeded by Dr. Paul M. Stewart.

Only one hospital is maintained by the Coast Guard. It is located at the Coast Guard Academy at New London, Connecticut, and the professional staff is furnished by the Public Health Service. Medical care for the Coast Guard personnel ordinarily is provided at the hospitals and outpatient clinics of the Service, or at civilian institutions where

contract arrangements with the Service are in effect. Medical care for dependents is secured at the established hospitals and clinics of the Service.

Assignment of Officers to Coast and Geodetic Survey

The assignment of Public Health Service officers to vessels of the Coast and Geodetic Survey was authorized by the Act of April 26, 1939. Dr. Raymond F. Kaiser was assigned on April 15, 1940, for duty on the *Explorer,* then based in Seattle, Washington.

Assignments of Service Officers Abroad

With the development of Federal responsibility for immigration and the establishment of the Immigration Service in 1891, the Marine Hospital Service was requested to assign medical officers for the medical examination of arriving aliens. Succeeding Acts of Congress authorized the Service to perform the medical functions for the Immigration Service and defined the responsibilities in this regard of both organizations. The Service continues to perform the medical work for the present Immigration and Naturalization Service.

The Act of 1893 authorized the detail of medical officers to American Consulates in foreign ports to assist in preventing the introduction of contagious or infectious diseases into the United States. A number of officers were immediately assigned because of outbreaks of cholera in several European countries. As occasion demands, medical officers are assigned to Consulates throughout the world because of outbreaks of epidemic diseases or of the existence of special problems affecting the public health. Continuously since 1893, medical officers have been on detail at several of the more important American Consulates abroad.

Immigration visas may be granted by the Consular officers of the United States under the Immigration Act of 1924 and the regulations issued under authority of that Act. With the inauguration of the practice of granting immigration visas in the principal countries of origin in 1925, medical officers of the Service have been assigned to Consulates to perform the immigration medical examinations in the several countries of Europe since that date.

Immigration was interrupted during the years of active hostility in World War II. Dr. Howard D. Fishburn was on duty in Germany in

1941 in connection with an immigration assignment. Dr. William S. Baum was assigned to duty in Germany in 1941. Dr. Charles G. Spicknall arrived in Germany in July 1941 for duty at the American Embassy at Berlin. Even though the United States had not at that time entered the war, immigration was very materially decreased. These medical officers were utilized for a time by the International Red Cross to make inspections of various prisoner of war camps in Germany. Dr. Herbert A. Spencer, then serving in Germany, was also assigned to make prisoner of war camp inspections at that time.

Doctors Fishburn, Baum, and Spicknall were interned by the German Government at Bad Nauheim on December 13, 1941, along with a group of American citizens, including personnel of the American Embassy at Berlin and American newspaper representatives. They remained at Bad Nauheim until the latter part of May 1942, when their release was effected. The entire group arrived in New York on the Gripsholm, a Swedish vessel, on June 1, 1942.

During the time they were interned in Germany, the Service officers mentioned above, under the direction of Doctor Fishburn, furnished medical care for the entire group of internees at Bad Nauheim. This work consisted of making daily sick calls and observing all internees for evidences of dietary insufficiency. They had the responsibility of allotting special foods that were furnished in restricted quantities to women, children, and members of the interned group who were ill.

Dr. Waldemar J. Wickman, who was on duty at the American Consulate in Warsaw in 1941, fortunately was able to get out of that city by air literally as the Germans marched in. He thus escaped internment.

Shortly after the cessation of hostilities following World War II, medical officers were again attached to selected Consulates in Europe to perform medical examinations of displaced persons and others applying for immigration visas to enter the United States.

Leprosy in Hawaii

Soon after the acquisition of the Territory of Hawaii the governing authorities recognized the urgency of leprosy as a health problem in the Islands. The Act of March 2, 1899, directed that a commission of medical officers of the Marine Hospital Service be appointed to investigate the

origin and prevalence of leprosy in the United States. Surgeon General Wyman on December 15, 1899, appointed the following as members of the commission: Dr. Joseph H. White, Dr. George Tully Vaughan and Dr. Milton J. Rosenau.

The commission submitted a report under date of November 30, 1901, which was printed as Senate Document No. 269, 57th Congress, 1st session. The report pointed out the importance of leprosy as a problem in the Hawaiian Islands and recommended appropriate measures to be instituted for the care and treatment of persons suffering from that disease. Recommendations were also made that studies as to the mode of spread, prevalence, and treatment of leprosy be undertaken.

The Act of March 3, 1905, provided for a study of the methods of transmission, cause, and treatment of leprosy with special reference to the care and treatment of persons so afflicted in the Territory of Hawaii. This Act also appropriated funds for the erection of necessary buildings, purchase of equipment, and operating expenses of a hospital and laboratory. The first director was Dr. Walter R. Brinkerhoff who was appointed March 2, 1906. His first studies were begun at the Kalihi Receiving Station, Honolulu. The leprosy station on the Island of Molokai three miles from Kalaupapa, the main leprosarium of Hawaiian Territory, was opened in July 1909. Dr. Donald H. Currie later became Director and Dr. Walter R. Brinkerhoff was then Assistant Director. In 1910 Dr. Moses Clegg succeeded Doctor Brinkerhoff as Assistant Director and in October 1911 Dr. George W. McCoy relieved Doctor Currie as Director. Doctor McCoy remained there until 1915 when he became Director of the Hygienic Laboratory in Washington, D. C.

The maximum number of patients to be under treatment at one time was limited to 40, and authority for admission of patients to the hospital was vested in the Territory of Hawaii. This relationship with the Territory of Hawaii in connection with the leprosy study continued until 1942 when, because of the War, the Territory assumed charge of the program.

Panama Canal

In 1904, at the request of the Medical Department of the United States Army, three officers of the Service, Drs. Henry R. Carter, James

C. Perry, and Claude C. Pierce, were assigned to duty in Panama for a period of several years during the construction of the Canal. In recognition of their meritorious services, promotion to the next higher grade was authorized by the Act of March 4, 1915.

Officer Assigned to Peruvian and Ecuadorian Governments

In 1904, Dr. Bolivar J. Lloyd was detailed to the United States Consulate in Callao, Peru, because of a severe outbreak of bubonic plague in Lima and Callao. On the ship en route from Panama to Peru, Doctor Lloyd found that the rats on board were dying of plague. Upon arrival at Callao, at the request of the master, he fumigated the vessel. Doctor Lloyd's duties in Callao were to endeavor to prevent plague, smallpox, and other diseases from being carried on outgoing vessels to the Canal Zone and the United States.

Because of an unusual outbreak of yellow fever in Guayaquil, Ecuador, Doctor Lloyd was transferred to the United States Consulate in that city in January 1906. The object of his assignment was to prevent yellow fever from being carried on vessels to the Canal Zone, and to ports in the United States. He was the only person in Ecuador at the time experienced in the laboratory diagnosis of plague.

Some time after his arrival in Guayaquil, plague was introduced from Peruvian or Chilean sources. The disease was first observed by Doctor Lloyd as an extensive epizootic in rats and confirmed by him bacteriologically. Rats died in large numbers and were frequently found dead or dying in the streets. He at once instituted measures to keep rats off outgoing vessels and notified Surgeon General Wyman and the U. S. Quarantine authorities in the Canal Zone as to the presence of plague in that port. Local authorities and the people generally at first doubted the presence of plague and resented the restrictions on outgoing vessels. After a few days cases of human plague began to appear and an epidemic ensued.

The President of Ecuador requested Doctor Lloyd to assume the presidency of a special sanitary commission to combat plague, yellow fever, and other diseases. He accepted the task and, working with local physicians and citizens, an active campaign was begun promptly. Later, at the

request of the Government of Ecuador, permission was given by the Government of the United States for Doctor Lloyd to be named Director of Health of the Republic of Ecuador; he thus became the first National Director of Health of that Republic under the terms of a law which he drafted and which was enacted by the Ecuadorian Congress.

Working in close cooperation with the United States health authorities in the Canal Zone, who were combating yellow fever on the Isthmus of Panama, Doctor Lloyd carried on a vigorous campaign for nearly three years in Guayaquil. Surgeon General Wyman detailed Dr. William M. Wightman to aid Doctor Lloyd in the work of inspecting and fumigating outgoing vessels. Unfortunately, Doctor Wightman contracted yellow fever and died in Guayaquil in 1909.

Doctor Lloyd carried on a vigorous campaign against plague, yellow fever, smallpox, and other epidemic diseases in Guayaquil. At the end of approximately three years, plague and yellow fever were greatly reduced and smallpox had been entirely eradicated. By mutual agreement and through official channels Doctor Lloyd was then permitted to resign his position with the Government of Ecuador and return to the United States, leaving behind him a well-organized and functioning public health organization.

Canadian Relationships

Excellent relationships between the Public Health Service, Canadian, and Mexican health authorities have been maintained through many years. For the purpose of considering problems of mutual interest, a conference is held, usually once a year, of the State and Provincial Health Officers. This includes national and provincial representatives from Canada. This meeting may occur at the annual conference of State and Territorial Health Officers or may be held during the annual meeting of the American Public Health Association. In the determination of the quality of drinking water used on common carriers, sanitary engineers in the Chicago and Washington offices of the Service constantly cooperate with their Canadian counterparts. In fact, the methods and procedures now in use for this purpose in Canada are similar to those employed in the United States. In the shellfish sanitation field, Canada

and the United States have problems of mutual interest, and here again their respective engineers and scientists work well together. As an example of the excellent relationships with our Canadian neighbors, the following is related:

An extensive outbreak of typhoid fever occurred in Montreal, Canada, during the months of March and April in 1927. Approximately 2,500 persons were reported as having contracted the disease during this outbreak. Because of the heavy traffic between Montreal and the United States and the possible transmission of the infection to the United States, particularly in view of the large number of American tourists constantly visiting that city, upon the invitation of the Canadian health authorities, four officers of the Public Health Service spent approximately two weeks in Montreal making a careful study of this outbreak. These officers were Dr. Leslie L. Lumsden, Dr. James P. Leake, Sanitary Engineer Harry R. Crohurst, and Dr. Clifford E. Waller. There was strong evidence that the principal cause of this outbreak was a typhoid carrier who was employed by a large milk pasteurizing plant in Montreal. There was some evidence that possible defects had occurred from time to time in the pasteurization process as carried out in a large pasteurization plant. Prompt corrective measures were taken as soon as the cause of the outbreak was determined.

Mexico

Bubonic plague was recognized by Mexican health authorities at Vera Cruz and Tampico during the early summer of 1920. Officers of the Service were assigned to those ports to insure proper quarantine measures for ships destined for the United States sailing from those cities. The plague outbreak reappeared at intervals in Tampico until the following year.

Early in 1921 the Federal health authorities of Mexico requested the assistance of the Charge d'Affairs of the United States at Mexico City in securing the services of an experienced medical officer of the Public Health Service to aid the Mexican authorities in Tampico in combating the recurrences of bubonic plague in that city. Dr. Carl Michel, who had previous experience in the control of bubonic plague, was sent to Tampico to work with the Mexican health authorities in suppressing

the outbreak and to insure that proper quarantine precautions were applied to ships clearing for ports in the United States. Doctor Michel remained in Tampico for these purposes until the first of October, 1921. The Mexican health authorities were pleased to have his assistance and cooperation and appointed him a permanent honorary consultant and counselor.

Although cordial relations have existed between Mexican health authorities and the United States, no formal organization was set up until 1943, when the United States-Mexico Border Public Health Association was established. Meetings of this association for the purpose of discussing public health problems of mutual interest are held either in Mexico or in the United States from time to time. For many years Mexicans have been eligible for membership in the Conference of State and Provincial Health Officers, and also the American Public Health Association.

International Joint Commission

The studies by Dr. Allan J. McLaughlin (1910-1911) disclosing the high typhoid fever rates existing among the populations of cities along the Great Lakes and the demonstration that these conditions were largely attributable to the sewage polluted public water supplies which had their sources in the Lake waters, focused national attention on the health hazard of our seriously polluted streams and surface waters.

The International Joint Commission, responsible for the control of boundary matters pertaining to Canada and the United States, shortly thereafter inaugurated a comprehensive study of the sanitary condition of the waters of the Great Lakes and secured the assignment of Doctor McLaughlin from the Service as their Sanitary Expert and placed him in charge of the field work, both in Canada and in the United States. They also engaged Professor Earle B. Phelps, as Consulting Sanitary Engineer to the Commission. He was later attached to the Hygienic Laboratory of the Service. Working with Doctor McLaughlin in this study was Dr. Paul Preble, who covered part of the Great Lakes, with headquarters at Buffalo, New York, and Dr. Lewis R. Thompson at Detroit, Michigan, who was responsible for the remainder of the Great Lakes area.

To secure water samples from the appropriate areas in the Great Lakes, a pattern of taking these samples had to be developed, especially in relation to pollution from streams emptying into the Great Lakes. Then, too, samples had to be taken at definite intervals on a straight course for a number of miles from the shore toward the central part of the Lakes. As the Lakes freeze over during the winter, sampling had to be done only during the open navigation season.

A suitable vessel was needed to go out on the Lakes for these water samples and related matters. During the summer of 1913, through the cooperation of the Commandant of the Coast Guard (then called Revenue-Cutter Service), a small cutter and crew were brought from Baltimore, Maryland, to the Great Lakes to be used by Doctor Thompson in collecting these water samples. This aid from the Coast Guard was of material help in obtaining the required water samples and other data as well as expediting the completion of the study.

The comprehensive reports of Doctor McLaughlin (January 16, 1914) and of Professor Phelps (March 16, 1916) on their findings concerning the nature and extent of the pollution of boundary waters, the suggested standards or limits of permissible pollution, and recommendations for remedial measures, still stand as classics in the field of water pollution examination and control.

Special Survey of Indians

Funds were appropriated by Congress in 1912, "to enable the Public Health and Marine Hospital Service to make a thorough examination as to the prevalence of tuberculosis, trachoma, smallpox, and other contagious and infectious diseases among the Indians of the United States, full report to be made to Congress not later than February 1, 1913, with such recommendations as may be deemed advisable" (Act of August 24, 1912). To perform this duty, rather suddenly imposed by Congress, 25 experienced Service officers were immediately assigned to conduct these surveys among the Indians. A comprehensive report summarizing the findings and presenting recommendations was submitted by the Service and published in 1912 as a Senate Document.

In 1924, Doctor John McMullen spent two weeks visiting a number of Indian reservations in company with Secretary of the Interior Hubert

Work, who was a physician. Commissioner of Indian Affairs Charles H. Burke, accompanied Doctor Work and Doctor McMullen on this trip. Doctor McMullen found trachoma to be prevalent among the Indians on several reservations. At some of them, he performed numerous operations to demonstrate for Indian Service physicians the methods used in the treatment of trachoma.

Bureau of Employees' Compensation

With the enactment of law in 1916 providing compensation and medical treatment for Federal employees injured in line of duty and creating the Employees' Compensation Commission, it became necessary to develop a staff to handle the medical aspects of compensation claims and the medical treatment program. Dr. Benjamin S. Warren, the first Service officer detailed to the Commission for that purpose, functioned as its medical director. As the work of the Commission has expanded and claims involving medical determinations have increased, additional medical officers have been detailed until in 1950 the staff totaled eight such officers. Claims involving medical determinations have averaged more than 87,000 annually during the last four years. Dr. Franklin J. Halpin is the present (1950) Medical Director thus assigned.

Bureau of Mines

Soon after it was organized in 1910, the Bureau of Mines wished to undertake certain investigations relating to health of miners and mine sanitation. Upon request the Public Health Service assigned Dr. W. Colby Rucker in 1910. Dr. Charles Wardell Stiles and Dr. Samuel C. Hotchkiss were detailed for a time in 1911. A year or so later Dr. Anthony J. Lanza was placed in charge of this work. In 1917, the Bureau of Mines obtained a specific appropriation for the assignment of additional medical officers of the Service to assist in expanded phases of these investigations. Three additional medical officers were detailed in 1917 to that Bureau and continued on that work for about two years. Because of the needs of the Service incident to World War I, Doctor Lanza and two of these officers were returned to the Service about two years later. The third officer, Dr. Royd R. Sayers, continued on the assignment

with the Bureau of Mines for about 17 years. During much of that time Doctor Sayers was Chief Surgeon or Chief of the Health and Safety Branch. He then returned to the Public Health Service where he was Chief of its Industrial Hygiene Division for about seven years.

On April 4, 1940, President Franklin D. Roosevelt authorized and directed Doctor Sayers to perform the duties of Acting Director of the U. S. Bureau of Mines. The appropriation Act for the Department of the Interior for the fiscal year 1941, which was approved June 18, 1940, contained the following language:

> Notwithstanding any other provisions of law, Royd R. Sayers, a commissioned officer on the active list, United States Public Health Service, is authorized to hold the office of Director of the Bureau of Mines in the Department of the Interior without loss of or prejudice to his status as a commissioned officer on the active list of the United States Public Health Service and if appointed to such civil office he shall receive in lieu of his pay and allowance as such commissioned officer, the salary prescribed by law for such civil office.

Upon nomination and confirmation by the Senate, Doctor Sayers became Director of that Bureau on June 18, 1940, in which capacity he served until July 13, 1947.

The Organic Act establishing the Bureau of Mines directs that it is to promote safety and health in the mineral industry, conserve mineral resources, and conduct investigations upon mining, preparation, and utilization of minerals. Under its Organic Act, the objective of the Bureau of Mines is the conservation of men and minerals.

The Bureau of Mines conducts a wide variety of activities and has established experimental stations and field laboratories in a number of mining centers in the United States. Many of these functions were on a national defense basis when Doctor Sayers became Director. Any program of military preparedness depends on an unobstructed flow of minerals. The Bureau of Mines, by virtue of the duties imposed upon it by Acts of Congress, is actually an important agency concerned with the defense of the United States. Under the Strategic Minerals Act of 1939, the Bureau of Mines, in cooperation with the Geological Survey, was given the responsibility of finding the minerals needed for defense activities.

(From USPHS Records)

Dr. Royd R. Sayers, Director, United States Bureau of Mines, 1941-1948.

The Coal Mines Inspection Act of 1941 and the Explosives Control Act, as amended in 1941, placed additional responsibilities upon the Bureau of Mines.

The Bureau of Mines, under the direction of Doctor Sayers, played a very important part in the war effort prior to and during World War II. Explorations by that Bureau for many of the minerals of which there was a shortage were productive and were of great importance in revealing additional sources of such minerals within this country.

The Bureau of Mines has charge of the manufacture of helium in the United States. This is an important element that is used in blimps and in anti-submarine warfare. War activities caused a great expansion in the manufacture of this element. Studies on the conservation, and particularly utilization, of natural gas and petroleum were also carried forward.

A native of Indiana, Doctor Sayers received a degree in chemistry from the University of Indiana in 1907. His medical training was obtained at the University of Buffalo where he graduated in 1914. Doctor Sayers served his internship with the Public Health Service and upon completion of that training entered the Regular Corps on January 6, 1915. He had several assignments before being detailed to the Bureau of Mines in 1917. His work with that Bureau and with the Division of Industrial Hygiene of the Public Health Service gave him opportunities to become one of the recognized authorities in industrial hygiene in the United States. He is an effective administrator. He retired from active duty with the Public Health Service in 1948.

United States Coal Commission

At the request of and in cooperation with the United States Coal Commission, beginning in March 1923 the Public Health Service made a series of sanitary surveys of coal mining camps and communities. This work was done by Dr. Robert Olesen, with the assistance of Dr. John F. Mahoney.

A number of representative communities were rated in accordance with a plan that had been evolved after a number of years' experience in making sanitary surveys of various industrial towns in different parts of the country. Of the 120 places surveyed, 19 were located in the anthra-

cite coal region of Pennsylvania, thus affording an opportunity of making a comparison with camps located in the bituminous fields. Representative camps and communities were surveyed in seven States, thus enabling a comparison of geographical locations as well.

Generally speaking, the majority of the smaller camps were lacking in many essentials, the standards usually improving as the size of the town increased. It was found that great diversity existed with regard to the source and safety of the water supplies. The principal faults connected with the water system seen in these mining towns were failure to provide a sufficient supply, objectionable taste of the water, inadequate protection of the supply against surface or subsurface pollution, and absence of convenient means of raising the water. A number of places were visited, however, in which all reasonable requirements, even to the extent of chlorination, filtration, and constant laboratory surveillance, were practiced.

More than 90 percent of the camps and towns visited had no system of garbage and refuse removal. Communicable disease control and prophylactic measures were inadequate in the majority of the camps. In only a small proportion of the places visited, were either full-time or part-time health officers or sanitary inspectors employed.

International Treaty for Control of Opium

In considering all phases of the problem of narcotic drug addiction, the Public Health Service following World War I established close relations with the Bureau of Narcotics of the Treasury Department and the Far Eastern Division of the State Department.

These two agencies regarded the treatment of narcotic addicts as one aspect of the control of traffic in opium. With their help a wider knowledge was gained through survey of the scope of drug addiction and where, when, and under what conditions it occurred. Such knowledge was of value in determining the needs with respect to development of hospitals for the treatment of narcotic addicts.

The opium treaty of 1925 was concerned with the international and domestic control of traffic in opium and its derivatives.

With the advent of the hospitals for the treatment of narcotic addicts, the control of the illicit traffic hinged in part upon the underground market for such drugs. Therefore, the treatment and segregation of the consumers of these drugs (illicit) were considered as phases of illicit traffic control, both by the Bureau of Narcotics and the State Department and also by the opium section of the League of Nations.

It seemed appropriate then, when a conference was arranged under the League of Nations in 1931 for the purpose of negotiating a treaty to limit the manufacture of narcotic drugs to the world's medical and scientific needs that Dr. Walter L. Treadway participate in that conference. He was chosen as a delegate on the part of the U. S. Government. The American Delegation with plenipotentiary powers included the following:

John Caldwell, of the Department of State
Harry J. Anslinger, Commissioner of Narcotics
Walter L. Treadway, of the Public Health Service
Sanborn B. Young, of California

This delegation signed the treaty with representatives of 51 other countries. The limitation of this manufacturing treaty was later ratified by the Senate.

Bureau of Indian Affairs

Mr. Charles H. Burke, Commissioner of Indian Affairs (April 1, 1921, to June 30, 1929), for some time had been concerned with the inability of his organization to attract competent professional personnel for career service in the health and medical work of the Bureau of Indian Affairs. The matter was discussed informally with Surgeon General Hugh S. Cumming in 1928 and, as a result, plans were completed and approved by the Secretary of the Interior and the Secretary of the Treasury whereby an officer of the Service, Dr. Marshall C. Guthrie, was detailed that year to act as Director of Health of the Bureau of Indian Affairs. Assisting Doctor Guthrie were several officers of the Service on his staff in Washington and a number of others serving as medical supervisors for the field service. This assistance to the Bureau of Indian Affairs was of material aid in improving the health and medical work of that organi-

zation. The Service continues to assign an officer as Director of Health and supplies the medical and dental staff of the Washington office.

In the sanitation field the Regional (formerly called District) office staffs have assisted the Bureau of Indian Affairs in their problems of sanitation on a great many of their reservations. This work was initiated in 1928 under a mutually agreeable arrangement. At present (1950), Sanitary Engineer Director H. Norman Old is assigned to that office to consult with its personnel regarding sanitary engineering matters; in addition, the Regional offices extend assistance to those reservations within their geographical areas.

Dr. Frank S. Fellows was the first officer of the Service to be assigned by the Bureau of Indian Affairs to duty in Alaska. He went to Alaska in 1931 and remained there for three years.

Bureau of Prisons

Until 1930 the medical service of the Federal prison system had no central direction or supervision and was provided by physicians employed locally. Recognizing the need for the rehabilitation of prisoners during their incarceration, Congress enacted a law in 1930 which placed upon the Service the responsibility for providing medical service in the Federal penal and correctional institutions.

The activities of the Federal Bureau of Prisons were reorganized in 1930 under the supervision of Sanford Bates,[1] then Director of that Bureau, and Austin H. MacCormick[2] and James V. Bennett,[3] Assistant Directors. As part of the reorganization plan, the Public Health Service was requested to supervise and furnish medical and psychiatric care for Federal prisoners.

Prior to the reorganization, each of the several Federal penal institutions operated more or less independently. There was little or no constructive, consistent medical rehabilitation effort made by the understaffed medical departments. The prisons were badly overcrowded, the Leavenworth and Atlanta Penitentiaries, for instance, each housing some 6,000 inmates or more than double their rated capacity. There was but

[1]Now Commissioner, Department of Institutions and Agencies, New Jersey.
[2]Now Executive Director, The Osborne Association, Inc., New York.
[3]Now Director, Federal Bureau of Prisons.

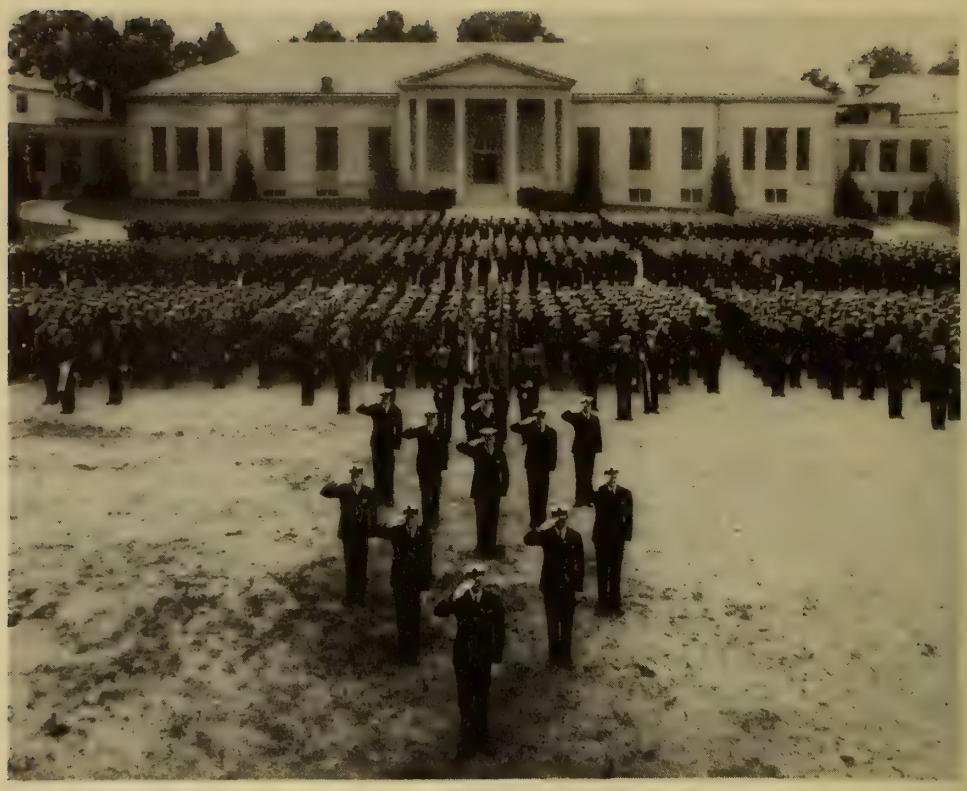
(From USPHS Records)

Medical Center for Federal prisoners, Bureau of Prisons, Department of Justice, Springfield, Missouri, 1949. The warden and professional staff are officers of the Service.

(From USPHS Records)

Medical staff from the Public Health Service assigned to the United States Penitentiary, Leavenworth, Kansas, 1941.

FIRST ROW (Left to right): Grace Schneider, R.N.; William S. Creppel (Administrative Assistant), Drs. James M. Caldwell, Louis Roucek, Clarence A. Eggler, John W. Cronin (Chief Medical Officer), Daniel J. Daley, Steve F. Price, Bryan W. Dawber, Manley B. Root, Selma A. Schwake, R.N. SECOND ROW: Donald D. Schroyer (Medical Guard Attendant), Joseph I. Worrell (Medical Guard Attendant), Richard Sears (Psychologist), Dr. Jacob Zellermayer, William J. Keenan (Medical Guard Attendant), Leon M. Patterson (Medical Guard Attendant), Dr. Charles W. Parker.



(Official United States Merchant Marine Academy Photo)

The Regiment of Midshipmen, United States Merchant Marine Academy, Kings Point, New York, 1949. The medical staff of this institution is furnished by the Public Health Service.

one full-time medical officer on the staff of the Leavenworth penitentiary at that time.

On the assumption that there is a considerable element of mental abnormality concerned in one way or another with conduct disorder, delinquency, and crime, the Service accepted the challenge and undertook the task of organizing a Division of Mental Hygiene to meet the problem of narcotic addiction and the development of a program of public health interest in the broad field of mental hygiene. This work was initiated under the direction of Dr. Walter L. Treadway.

The principles that were developed for the treatment of Federal prisoners stressed the provision of medical, surgical, and psychiatric measures for the correction of remediable disabilities, on the assumption that a healthy body and mind are conducive to "right" thinking and reacting, whereas disease and defects encourage warped thinking and reacting; the extension of the psychiatric part of this program so as to expose every inmate during the entire period of incarceration to all available and pertinent forms of formal and informal group psychotherapy; the classification of Federal prisoners, and the provision of treatment, work-assignment, and other programs suited as nearly as possible to the individual needs of each prisoner. Another important matter is the development of a release program for prisoners about to be discharged, on the assumption that eventually the great majority of them will be released into society, where their success or failure of adjustment will depend upon the two important factors of their preparation for release and the preparation of society to receive them.

During the ten years beginning about 1930, overcrowding was reduced and classification provided for by the construction of several new penal and correctional institutions. Medical housing, equipment, and staffing were fully modernized. Regular and reserve officers of the Service were carefully chosen for their psychiatric ability and interest in penology and were detailed as "Chief Medical Officers" to the several institutions. Staffs of full-time psychiatrists, psychologists, and internists and of part-time consultants in surgery, urology, eye-ear-nose-and-throat, and other pertinent specialists were developed.

An officer of the Service heads the unique Medical Center for Federal Prisoners of the Bureau of Prisons, a 1,200-bed hospital for disabled

Federal prisoners at Springfield, Missouri. He acts in the capacity of "Warden" (appointed by the Attorney General) and as "Chief Medical Officer" (appointed by the Surgeon General). The Medical Center for Federal prisoners was authorized by an Act approved May 13, 1930. The institution was opened in 1933 with Dr. Lawrence Kolb as Warden and Chief Medical Officer. Upon Doctor Kolb's transfer in 1935, Dr. Marion R. King succeeded him, remaining there until the beginning of World War II in 1941. The officer serving in that capacity in 1950 is Dr. Ivan W. Steele. A program of psychiatric and biochemical research into the causes and cures of conduct disorder, delinquency, crime, and sexual abnormalities, and other refinements of a modern program were well under way when World War II necessarily put an effective stop to all but essential routine activities. Resumption of these refinements has been slow in the post-war period because of the difficulty of securing qualified personnel and adequate funds. However, the general features of the program continue to be a worthwhile improvement over anything that could conceivably be substituted, and the work of the Service in this field is regarded as a very satisfactory arrangement from the standpoint of both the Bureau of Prisons and the Public Health Service.

There have been admitted to Federal prisons in the last twenty years about 300,000 prisoners, all of whom had contact during their prison sentences with officers of the Service. The median of time served by Federal prisoners is 16.1 months (as compared with 25.8 months for those released from State prisons generally). The influence of the Service in this field is far reaching, extending as it does through a cross section of some 20,000 prisoners (in 20-odd institutions) and parolees, to their families and associates in the community at large. It is only by influences such as this that an effective curb on conduct disorder, delinquency, and crime will be realized.

Dr. Justin K. Fuller was the first officer of the Service to be assigned to full-time duty as Medical Director of the Bureau of Prisons. He began his duties there on June 18, 1937, and continued until, because of World War II, he was transferred elsewhere in 1941. Dr. Marion R. King was his successor.

In a systematic fashion, the technical staffs of the Regional offices of the Service have been consulting with the heads of Federal prisons on sanitation problems since 1929. In 1945 an engineer, Graham Walton, was assigned to the Bureau of Prisons for a period of about three years to prepare a manual on institutional sanitation.

Department of Agriculture

Prior to 1915, the policy of utilizing convict labor in road construction or in the preparation of road materials was inaugurated by several State legislatures. A number of States at that time were actively employing convicts on road work while other States were seeking information on the subject. The Department of Agriculture in 1915 undertook a study of convict labor for road work in connection with the activities of the Office of Public Roads and Rural Engineering. The Public Health Service was requested by that Department to assign a medical officer to assist in the medical and sanitary aspects of this study. Dr. Warren F. Draper was assigned to this duty. A comprehensive report covering the study was printed as a Department of Agriculture Bulletin in 1916.

The Pure Food and Drug Act of 1906 was administered for a number of years by the Bureau of Chemistry of the Department of Agriculture. Dr. Harvey W. Wiley, a physician, was Chief of the Bureau of Chemistry. At his request Dr. Mervin W. Glover was assigned to that Bureau from September 1915 until June 1923. On this assignment Doctor Glover assisted in the administration of the Pure Food and Drug Act. Later the Food and Drug Administration was established, and the administration of the law was transferred to that organization.

The Farm Security Administration was established by President Franklin D. Roosevelt in 1935 to meet the problems of large numbers of rural families who during that time of financial stress were unable to secure adequate credit or to support themselves on farms. It soon became apparent that the health of these rural families was a very important factor in their financial condition and their economic rehabilitation. The Public Health Service was requested to assign medical personnel to furnish health guidance for the programs that were being developed by the Farm Security Administration. Several medical officers were assigned upon the request of the Farm Security Administration,

some of them serving over a period of several years beginning in 1936.

The officer assigned as Chief Medical Officer of the Farm Security Administration in 1936, Dr. Ralph C. Williams, found that one of the most important problems facing the families with which that organization was concerned was the lack of adequate medical care. Over a period of five or six years there was developed an active medical care program that during its peak had in existence more than 1,000 medical care units consisting of one or more counties and providing medical services for several hundred thousand farm families. This program was developed with the cooperation and assistance of State and local medical societies. The safeguarding of water supplies and the safe disposal of human wastes at the homes of these families were also important parts of the general program of rural rehabilitation.

Miscellaneous Assignments

Dr. Victor G. Heiser served as Director of Health of the Philippine Islands from 1905 to 1915. He was succeeded by Dr. John D. Long who served as Director until December 1918.

Dr. George W. McCoy served as sanitary adviser to the Governor of Hawaii from 1911 to 1915.

Dr. Allan J. McLaughlin served as medical adviser of the International Boundary Commission from January 1, 1913, to October 31, 1914. Dr. Leland E. Cofer was Health Officer for the Port of New York from April 21, 1918, to February 28, 1921.

The Federal Trade Commission, in 1938, requested the assistance of the Service in the assignment of medical officers in the regulation of advertising claims relating to medical products. Dr. Knox E. Miller served as Chief Medical Officer of the Federal Trade Commission until 1942.

In 1921, in accordance with an agreement with the National Park Service, sanitation consultative work in all of the National Parks was performed by Public Health Service engineers. Harry B. Hommon, who was in charge of what was then Interstate Sanitary District 5-6 in San Francisco (now Region 10), had as an additional responsibility national parks in the United States. His first assistant, dating also from 1921, was Arthur P. Miller, who was stationed in Yellowstone National Park dur-

ing three summers, 1921-1923. Here were designed the sanitary works needed for disposal of sewage which were constructed in this park to care for the wastes from ever-increasing numbers of travelers. Some years later the National Park Service work was divided and Mr. Hommon handled it only in the western parks while the eastern ones were attended to by the staff in what was then Interstate Sanitary District No. 2 in Washington, D. C. At present, the same good relations exist with the National Park Service, and consultative activities are carried on with their local superintendents by staffs of all the Service regional offices involved.

Dr. Alfred B. Geyer served for several months as medical officer for the Third Byrd Antarctic Expedition in 1939.

State and City Health Officers

From time to time requests are received from Governors of States to permit officers of the Service to be detailed to act as State Health Officers. Among the earlier officers to serve in that capacity were Dr. Allan J. McLaughlin, for the State of Massachusetts for four years, 1914 to 1918; Dr. Frederick E. Trotter, for the Territory of Hawaii from 1919 to 1923; Dr. Clifford E. Waller, for the State of New Mexico from 1920 to 1923; Dr. Erval R. Coffey, for the State of Washington from 1933 to 1936; Dr. Warren F. Draper, for the State of Virginia from 1931 to 1934; Dr. Thomas Parran, who later became Surgeon General, for the State of New York from 1930 to 1936; and Dr. Roger E. Heering, for the State of Ohio from 1945 to 1947.

Officers of the Service currently (1950) serving as State Health Officers are Dr. Herman E. Hilleboe, for the State of New York since 1947; Dr. Wilson T. Sowder, for the State of Florida since 1945; Dr. John D. Porterfield, for the State of Ohio since 1947; and Dr. Leroy E. Burney for the State of Indiana since 1945.

Officers of the Service who have served as Acting State Health Officers in order to permit the State Health Officers to receive special training or to fill sudden or unexpected vacancies include Dr. M. Flint Haralson for the Territory of Hawaii from 1940 to 1943, and for the State of Colorado from July 1935 to September 1936; also, Dr. Charles F. Blankenship for the State of Nevada from October 1948 to July 1949.

Dr. George B. Young was Health Commissioner of Chicago from 1911 to 1915. Dr. John F. Mahoney retired from the Service early in 1950 after more than 30 years' service and became Commissioner of Health for the City of New York.

From 1919-1921 sanitary engineers served with many State health departments which at that time did not include engineers on their staffs. Mr. C. Nelson Harrub served as State Sanitary Engineer for Tennessee, and Mr. Arthur P. Miller performed a like service in Kentucky. Such personnel loans to States served their purpose well because following these tours of duty many States employed their own engineering personnel.

World War II and After

During and following the war, medical and other professional personnel were assigned to a number of governmental agencies in the prosecution of the war effort, or immediate postwar activities. This included a number of field personnel assigned to the United Nations Relief and Rehabilitation Administration, as well as the headquarters staff which was for a time under the direction of Dr. James A. Crabtree. Doctor Crabtree also served for a time with the Procurement and Assignment Branch of the War Manpower Commission. Medical examinations of laborers imported from Mexico and the West Indies to carry on important agricultural work during the war were performed by Service Officers for the War Manpower Commission.

Beginning in early 1942 and continuing until 1947, Service medical, dental, and nurse officers were assigned upon request of the Immigration and Naturalization Service to furnish professional care to immigration detainees and interned aliens at several immigration detention stations.

An important permanent development concerning the merchant marine of the United States during World War II was the establishment of the United States Merchant Marine Academy at Kings Point, New York, on Long Island, about 30 miles out of New York City. The medical, dental, and nursing staff of this institution, which during peacetime has an enrollment of approximately 1,000 cadet-midshipmen, is fur-

nished by the Public Health Service. An important development there was the establishment of a course in ship medicine and ship sanitation. This course was inaugurated under the supervision of Sanitary Engineer James H. Le Van of the Public Health Service while on duty there. This officer, the author of the textbook *Ship Sanitation* used in this course, has also been the instructor in this subject since the inception of the course. There also are training stations for seamen at Sheepshead Bay, New York, and Alameda, California.

During the early postwar period it became apparent to the State Department that the health of the people had an imporant bearing on economic recovery in many of the countries receiving assistance from the United States. Dr. Louis L. Williams, Jr., was assigned in 1945 as Medical Adviser for duty with the Division of International Labor, Social and Health Affairs of the State Department.

An Act approved July 6, 1943, authorized a grant-in-aid program for rehabilitation of the physically handicapped to be conducted by the Office of Vocational Rehabilitation. The objective of this program is to place the disabled person, fully prepared, in a job which utilizes his best skills and his full physical and mental capacities. Medical consultation and guidance are important to various aspects of such a vocational rehabilitation program. A staff of medical consultants has been assigned to the Office of Vocational Rehabilitation from the Public Health Service since 1944. Dr. Dean Clark was the first Chief Medical Officer, followed by Dr. Jack Masur and Dr. Victor H. Vogel. Dr. Thomas B. McKneely is serving in that capacity at this time (1950).

To assist the State Department in developing a program for medical care of officers and employees of that Department on duty outside the United States, Dr. Marion R. King was assigned as Medical Adviser to the Division of Foreign Service Personnel of the State Department in 1947. He retired in 1950 and was succeeded by Dr. Virgil T. DeVault.

The National Security Act of 1947 established the National Security Resources Board. An important function of this Board had to do with the protection of the civilian population in case of war. A medical officer, Dr. Norvin C. Keifer, and a sanitary engineer officer, Vincent B. Lamoureux, were assigned to the Health Resources Office of that organization in 1950.

CHAPTER VII

International Health Relations

Since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed.—Constitution of the United Nations Educational, Scientific, and Cultural Organization

Early International Sanitary Conferences

The earliest attempt at international health cooperation was made at the first International Sanitary Conference in Paris in 1851. The conference was preceded by the action of the French Government in 1847, in appointing medical sanitary agents in the Near and Middle East. These agents stationed in Constantinople, Smyrna, Beirut, Alexandria, Cairo, and Damascus gathered information on sanitary conditions in the East which formed the basis for the calling of the First Sanitary Conference.

An unsuccessful attempt was made at this Conference to reach agreement on an international convention governing quarantine measures to prevent the spread of cholera, smallpox, and yellow fever. This first attempt at international health teamwork failed largely because too little was known of the methods of transmitting disease to demonstrate the need for quarantine and other control measures. Commercial and political factors dominated the consideration of the proposed convention by national governments and were permitted to overshadow the health aspects. Indeed, the medical evidence at hand was so conflicting that it was in itself an obstacle to international agreement. When the state of medical knowledge at that time is recalled, it can easily be understood that medical men coming from all parts of Europe would find it difficult to agree. The process of contagion was a subject creating wide differences of opinion, since the science of bacteriology had not yet been developed.

Despite these difficulties, the delegates from the 12 nations represented at the Conference* worked out a draft convention providing for a system of notification and quarantine for cholera, plague, and yellow fever. The convention never took effect, however, since it was ratified by only three nations—France, Portugal, and Sardinia—and Portugal and Sardinia withdrew from the convention 14 years later. The Conference also recommended that European physicians be sent to the Western Hemisphere to investigate the causes of yellow fever.

Three more unsuccessful efforts to reach an international agreement on the prevention of the spread of disease were made during the next 30 years.

The French Government invited only diplomats to the Second International Sanitary Conference convened in Paris in 1859, with a view to eliminating the lengthy discussions of the technical delegates which were believed to have "confused the issue" at the Conference of 1851. A draft convention was drawn up at the second conference, but political unrest in Europe prevented any action toward ratification.

The Third International Sanitary Conference in Constantinople in 1866 was inspired by the havoc wrought by the spread of cholera in 1865 by the pilgrims to Mecca. The disease broke out in Mecca during the yearly Moslem festival which had attracted thousands of the faithful from many parts of the world. The cholera outbreak caused panic among the pilgrims and a general flight ensued.

Seventeen countries sent delegates to the Constantinople Conference in 1866. The French specialists who had taken the lead in studying the origin and spread of the epidemic immediately proposed the appointment of an International Commission to report on the problem to the Conference. The Conference concurred and the Commission submitted a surprisingly accurate report on the origin, spread, and characteristics of the disease. On the basis of this report, the Conference recommended the establishment of an International Sanitary Station at the entry to the Red Sea and the organization of an International Sanitary Service to operate along the Red Sea Coast. While the proposed convention was not signed by any of the countries represented at the Conference, the

*The countries represented were Austria-Hungary, Greece, The Papal State, Portugal, Russia, Sardinia, the two Sicilies, Spain, Turkey, Tuscany, and France.

study of the disease and the recommended sanitary measures were the inspiration of later work.

The Fourth International Sanitary Conference in Vienna in 1874 was also the result of the threat of cholera. In 1869, the Suez Canal had been opened and medical authorities were concerned by its effects in accelerating the spread of epidemic diseases from the East. In addition, Russia, which suffered from a long siege of the disease, was protesting the quarantine measures applied against its commerce and asked that the matter be reconsidered. The Vienna Conference voted against any land quarantine and suggested that, where desired, a system of medical inspection instead of quarantine be adopted. The medical inspection proposed involved the detention of only those found to be suffering from cholera, or suspected of being infected.

The United States did not participate in any of these conferences. The Marine Hospital Service, however, was conscious early in its history of the importance of international health action. At the Centennial International Medical Congress held in Philadelphia in 1876, Dr. John M. Woodworth, Surgeon General of the Marine Hospital Service, submitted six propositions for the consideration of the section on sanitary science, the last of which was as follows:

> The endemic homes of cholera and yellow fever are the fields which give the greatest promise of satisfactory results to well-directed and energetic sanitary measures, and to this end an international sentiment should be awakened so strong as to compel the careless and offending people to employ rational means of prevention.

The following joint resolution was approved by Congress on May 14, 1880:

> Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States is hereby authorized to call an international sanitary conference to meet at Washington, District of Columbia, to which the several powers having jurisdiction of ports likely to be infected with yellow fever or cholera shall be invited to send delegates, properly authorized, for the purpose of securing an international system of notification as to the actual sanitary condition of ports and places under the jurisdiction of such powers and of vessels sailing therefrom.

INTERNATIONAL SANITARY CONFERENCE HELD IN WASHINGTON

The Conference convened in Washington, January 5, 1881. The representatives for the United States were John Hay, Assistant Secretary

of State; Dr. James L. Cabell, President of the National Board of Health of the United States; Dr. Thomas J. Turner, Secretary of the National Board of Health; J. Hubley Ashton and James Lowndes, Special Delegates.

Other countries represented at the Conference in addition to the United States were Argentina, Austria-Hungary, Belgium, Brazil, Chile, Cuba, Denmark, France, Germany, Great Britain, Haiti, Hawaii, Italy, Japan, Mexico, Netherlands, Norway, Portugal, Russia, Spain, Sweden, Turkey, and Venezuela.

This Conference was notable for the contribution made by Dr. Carlos Finlay, the Special Delegate of Cuba, on his research on yellow fever, the first public statement of a very significant factor in the control of that disease—the important links in the epidemiological chain:

1. The presence of a previous case of yellow fever within certain limits of time, counting back from the moment we are considering.
2. The presence of a person apt to contract the disease.
3. The presence of an agent entirely independent for its existence both of the disease and the sick man, but which is necessary in order that the disease shall be conveyed from the yellow-fever patient to a healthy individual. (*Proceedings,* p. 119)

The proceedings at the Washington Conference were in many ways typical of those that had preceded it. Although the threat of the spread of disease across national boundaries was being increasingly recognized, there was considerable reluctance to engage in any international control system that might infringe upon the authority of national quarantine systems. The Convention developed at the Washington Conference was weakened by the adoption of compromise proposals instead of the relatively firm United States proposition for a system permitting authorities of foreign countries to check on health conditions in port cities of other countries and certify the sanitary conditions of vessels sailing for their home countries.

LATER CONFERENCES

Other European nations, particularly France, objected vigorously to this attitude, and in 1885 Italy issued a call for a sanitary conference to be held in Rome to attempt to reach an agreement on the issue.

Twenty-seven nations were represented at this meeting, including the United States. A "code de police sanitaire internationale" was drawn up, covering principally cholera and yellow fever, but it was not ratified. The pressure for effective control measures at the Suez Canal continued, nevertheless, and finally, in the Venice Conference of 1892 an agreement was drawn up which governed the duration and method of quarantine of vessels passing through the Canal. This was the first international sanitary convention to be ratified.

The Venice Conference of 1874 had been followed by a series of sanitary treaties in which various quarantine principles were developed. The threat of the spread of epidemic disease had become so great that governments were reluctantly forced to agree to increasingly broad systems of international control and cooperative action. Whereas the first six international sanitary conferences, held in the 20-year period between 1851 and 1871, had failed to produce agreements that were acceptable to the participating governments, in the next 40 years eight conventions were developed that were signed by most of the principal commercial nations.

At the Dresden Conference held in 1893, the principle of "surveillance" was recognized for the first time. The Conference formulated a system of sanitary measures which fixed the period of detention and isolation, defined the distinction between medical surveillance and observation, and permitted a person arriving from an infected port to proceed to his destination although being kept under observation during the period of incubation. The United States was not represented at either the Conference of Venice or that of Dresden.

Sanitary regulations governing pilgrimages to Mecca were adopted at the Paris Conference of 1894. Although that Conference was called primarily to develop measures to prevent the spread of cholera from Asiatic to European countries, the United States was interested and was represented by Surgeon Preston H. Bailhache of the United States Marine Hospital Service, Dr. Stephen Smith of New York, and Dr. E. O. Shakespeare of Philadelphia. Countries represented at the Conference, in addition to the United States, were Austria-Hungary, Belgium, France, Germany, Great Britain, Greece, Italy, Netherlands, Portugal, Russia, Spain, Sweden and Norway, Persia, and Turkey.

(Courtesy of the Pan American Sanitary Bureau)

The Fourth International Sanitary Conference, San José, Costa Rica, January 1, 1910. • Representing the Public Health and Marine Hospital Service were Surgeon General Walter Wyman, Dr. Rudolph H. von Ezdorf, and Dr. John W. Amesse.

(Courtesy of the Pan American Sanitary Bureau)

First Conference of National Directors of Health, Pan American Union, 1927. • Representing the Public Health Service were Surgeon General Hugh S. Cumming, Dr. Samuel B. Grubbs, and Dr. Bolivar J. Lloyd.

(United Nations Photo)

Signing of the Agreement between the World Health Organization and the Pan American Sanitary Organization, May 24, 1949.

SEATED (Left to right): Dr. Martha Eliot, Assistant-Director-General, World Health Organization; Dr. Frank I. Calderone, World Health Organization; Dr. Brock Chisholm, Director-General, World Health Organization; Dr. Alfredo Arreaza Guzmán, Venezuela; Dr. Fred L. Soper, Director, Pan American Sanitary Bureau. STANDING: Dr. Alberto Zwanck, Argentina; Dr. Joaquín Alvarez de la Cadena, Mexico; Dr. Heitor P. Fróes, Brazil; Mr. Howard B. Calderwood, U. S. Department of State; Dr. Luis F. Galich, Guatemala; Dr. Antonio Bueno García, Mexico; Dr. L. L. Williams, Jr. (Public Health Service, assigned to U. S. Department of State); Mr. Sidney P. Wheelock, Canada; Dr. H. van Zile Hyde, U. S. Public Health Service; Dr. John R. Murdock (Public Health Service, assigned to Pan American Sanitary Bureau); Dr. Miguel E. Bustamante, Secretary General, Pan American Sanitary Bureau; Dr. P. C. A. Antunes, Pan American Sanitary Bureau; Dr. Emilio Budnik, Pan American Sanitary Bureau.

(Urs G. Arni, Genève)

Yellow Fever Panel, World Health Organization, Geneva, December, 1949.

LEFT TO RIGHT: *Dr. F. L. Soper, Director, Pan American Sanitary Bureau; Médecin-Colonel G. Saleun, Paris, France; Dr. A. F. Mahaffy, formerly Director, Yellow Fever Research Institute, Entebbe, Uganda; Dr. Waldemar Antunes, Director, National Yellow Fever Service, Ministry of Education and Health, Rio de Janeiro, Brazil; Dr. G. L. Dunnahoo, Public Health Service, Washington, D. C.*

At the Paris Conference the United States delegates pointed out that the preceding conferences had failed to provide for the sanitary supervision of immigration from Europe to America. Doctor Shakespeare declared that more than 400,000 immigrants from Europe were arriving annually in United States ports, creating an intimate relation between the sanitary conditions in Europe and the United States. He asserted that the measures developed by Europe to prevent the importation of cholera from the East should form the basis for measures to prevent introduction of the disease into the United States.

Surgeon General Wyman pointed out to the Secretary of State in 1895 that Havana, Cuba, was the primary focus of the spread of yellow fever into the United States. In the period from 1800 to 1894, according to Doctor Wyman, there had been only seven years in which yellow fever had not visited the United States. Acting upon this information from the Marine Hospital Service, the Secretary of State forwarded a tactful message to the Spanish Minister in Washington declaring that sooner or later the problem of attacking the pestilential conditions which exist and have existed for more than a century at Havana will demand the attention not only of Spain but of other endangered countries, with a view to devising an effective remedy for the state of things disclosed in Surgeon General Wyman's report. The message stated that the gravity of the situation invited timely attention and action.

The Venice Conference of 1897 developed a convention to guard against the spread of bubonic plague which had appeared in Bombay in the preceding year, and in Hong Kong in 1894. (The United States was not officially represented at this conference.) It was in Hong Kong that plague first appeared in modern times. Here the plague organism was discovered independently in 1894 by Dr. Alexander Yersin and Dr. Shibasaburo Kitasato.

International Sanitary Conventions

The first of the modern sanitary conventions was drawn up at the Paris Conference of 1903. Dr. Henry D. Geddings of the Service was the delegate in behalf of the United States. The International Sanitary Convention adopted at the Paris meeting unified the earlier conventions of 1892, 1893, 1894, and 1897. It included an agreement among

nations to notify each other of the existence of communicable disease. The Convention was notable in that it was the first to introduce some degree of uniformity of action against the importation of cholera and plague. It also included an agreement that the signatory nations would not exceed the maximum quarantine requirements laid down in the convention. By 1907, the Convention had been ratified by most of the participating countries.

The conference recommended that countries exposed to yellow fever modify their requirements to conform with the discovery of the conveyance of the disease by mosquitoes.

At the Rome Conference in 1907, the United States joined with other governments (Belgium, Brazil, Egypt, France, Great Britain, Italy, the Netherlands, Portugal, Rumania, Russia, and Switzerland) in organizing the International Office of Public Health. All signatory nations pledged to report the occurrence of cholera, plague, smallpox, typhus, and yellow fever to the International Office, which in turn would notify all member governments.

Under the agreement for the establishment of the International Office provided for by the International Sanitary Convention of 1903, the French Government was assigned the task of presenting to interested nations propositions regarding its organization. These proposals were considered and revised during the succeeding four years, and when the Rome Conference was convened the foundation for international concurrence had been laid. At the Rome Conference the United States was represented by Dr. Allan J. McLaughlin of the Public Health and Marine Hospital Service and Mr. R. S. Reynolds Hitt, First Secretary of the Embassy at Rome. Under the agreement reached at Rome, it was decided that the various countries should be divided into categories as far as their support of the organization was concerned.

International Office of Public Health Established in Paris

The Rome Agreement, ratified by the United States on February 15, 1908, admonished the International Office not to interfere in any way in the administration of different countries, and defined its principal functions as the collection and distribution of facts and documents of general public health interest, especially those which related to infectious dis-

eases—in particular, cholera, plague, and yellow fever. The International Office was also obligated to publish a monthly bulletin—well-known during the 40 years of its existence as the *Bulletin mensuel de l'Office international d'hygiene publique*—which was to contain (1) legislation on communicable disease, (2) information on the spread of diseases, (3) information on measures taken for environmental sanitation, (4) public health statistics, and (5) bibliographical notes.

The International Office was finally constituted in 1908, and in 1909 its seat and secretariat were established in Paris. The number of governments adhering to the Rome Agreement increased until 55 were represented on its governing body—the Standing Committee (Comite Permanent)—which usually met twice a year.

The Paris Office promoted the development of improved international sanitary conventions which were successively drafted in 1912, 1926, and 1933, the latter convention relating to aerial navigation.

The International Office continued to operate until 1946 when it was liquidated except for a skeleton staff. In 1950, it was completely absorbed by the World Health Organization.

International Health in the Western Hemisphere

The first effective, though regional, international health organization was created in 1902, when the Pan American Sanitary Bureau was organized by the First Inter-American Sanitary Conference.

The countries of the Western Hemisphere had been repeatedly attacked by epidemics of disease long before any concerted action was taken to prevent the international spread of disease. Smallpox was a constant menace taking an annual toll of hundreds of thousands. Beginning in the sixteenth century, outbreaks of death-dealing typhus swept the two continents. Yellow fever was a formidable foe which threatened and impeded international commerce. Yellow fever swept Yucatan and Cuba in 1648 and appeared in what is now the United States in 1668. The records also indicate that this disease was in Brazil in 1685, Venezuela in 1694, Colombia in 1729, Panama and Ecuador in 1740, and Peru, Chile, Uruguay, and Argentina later. Plague was introduced into the Western Hemisphere in 1899-1900 and spread from some of the ports toward the interior. In some countries of that Hemisphere

it still maintains a foothold. Following the development of steamships about the middle of the nineteenth century, epidemic cholera and yellow fever spread in menacing tides, compelling countries to inaugurate protective measures.

Quarantine measures aimed at preventing the introduction of diseases were adopted by individual ports, colonies, and countries. Quarantine services were organized at first in ports and later on a national scale. If one port lowered its requirements, others would suffer. This led to constant recriminations and entailed danger to the public health. The disastrous consequences unavoidably involved in such a disordered course precipitated the need for remedial measures.

The advisability of enforcing efficient uniform regulations governing inter-American traffic received first formal recognition at a meeting in Montevideo, Uruguay, in 1873. This resulted in the first agreement on the part of representatives of the American Republics to cooperate on an international program of maritime defense against disease.

The First International Conference of the American States was held in Washington, D. C., 1889-90, at which all American Republics, with the exception of the Dominican Republic, were represented. The Conference, recognizing the importance of providing a better and less vexatious system of quarantine, appointed a committee to consider the possibilities for united action in the field of pestilential diseases and especially yellow fever, from the standpoint of maritime transmission. Unfortunately, the committee did not include sanitarians to provide concrete measures in public health.

Pan American Sanitary Bureau Organized

The history of cooperative health activities in the Western Hemisphere, however, really begins with the organization of the Pan American Sanitary Bureau. Briefly, it may be stated that the creation of the Pan American Sanitary Bureau was authorized by the Second International Conference of the American States, which met in Mexico City in 1901-1902. It was organized by the First Inter-American Sanitary Conference, which met in Washington, D. C., in 1902, and its name was changed from "International Sanitary Office" to "Pan American Sani-

tary Bureau" by the Fifth Inter-American Sanitary Conference, which met in Santiago, Chile, 1911. Its reorganization was accomplished by the Sixth Pan American Sanitary Conference, which met in Montevideo, Uruguay, in 1920. The Twelfth Pan American Sanitary Conference, which met in Caracas, Venezuela, in 1947, authorized a further reorganization and expansion of duties and functions. This reorganization was completed by the First Meeting of the Directing Council which met in Buenos Aires in 1947 and adopted a Constitution of the Pan American Sanitary Organization. At present the Pan American Organization consists of four sections: (a) The Pan American Sanitary Conference; (b) The Directing Council; (c) The Executive Committee; and (d) The Pan American Sanitary Bureau.

Public Health Service Participation in Health Work of Pan American Sanitary Bureau

Officers of the U. S. Public Health Service have taken an active part in planning, creating and directing the activities of the Pan American Sanitary Bureau. From the time of its creation in 1902 up until 1936, the Directors of the Bureau were the Surgeons General of the U. S. Public Health Service. From the date of the creation of the position of Assistant Director in 1920, this post has been held by officers of the Service. The majority of the professional field staff of the Bureau up until recently have been Service officers.

Authority for the assignment of Service officers to the Bureau is provided for in Articles 55 and 58 of the Pan American Sanitary Code, a sanitary treaty that has been duly ratified by the Governments of the 21 Republics that comprise the Organization of American States. The salaries of all officers of the Public Health Service assigned to the Bureau up until 1949 were paid by the Service. Some few officers have been assigned to the Bureau for long periods of time, others for a year or two, while still others have had temporary assignments for specific duties, usually in response to a request from a Latin American Republic.

Surgeon General Walter Wyman, of the Public Health and Marine Hospital Service, played a leading role in the first four Inter-American Sanitary Conferences, acting as President of the first two conferences

and attending as the United States Delegate during the third and fourth. He was director of the Pan American Sanitary Bureau from the time of its creation in 1902 until his death in 1911. Many of his health policies and principles were adopted by the newly formed Pan American Sanitary Bureau.

Dr. Hugh S. Cumming, who became Surgeon General of the Public Health Service on January 27, 1920, and retired February 1, 1936, served as Director of the Bureau from the time of his election by the Sixth International Sanitary Conference in Montevideo, Uruguay, December 12-20, 1920, until February 1, 1947. After his retirement from the Service in 1936, he continued to direct the Pan American Sanitary Bureau until February 1947. As mentioned, the Sixth Conference also set up the position of a Vice-Director for the Bureau, and Dr. Joseph H. White of the Service was appointed soon thereafter in 1920 to fill that position. With the assistance of Doctor White, Doctor Cumming began to reorganize the Bureau.

The Pan American Sanitary Code was adopted at the Seventh Conference which was held in Havana, November 5-16, 1924. This Code was in the form of a Treaty and was subsequently ratified by all of the American Republics. It served to unite member Republics in an effort to prevent the international spread of disease, to attack the problems of quarantine in a practical manner, and to establish uniform procedures in all the countries of the Americas. It provided for a central office where all statistical information relating to health was collected and distributed. It brought about much closer relations between the individual republics of the organization and provided a means for attacking problems of mutual interest.

Public Health Service Officers Assigned to Pan American Sanitary Bureau

In 1933 Doctor Cumming appointed Dr. Bolivar J. Lloyd as Vice-Director of the Bureau and turned over to him the immediate charge of the headquarters office of the Bureau. A great deal of credit goes to Doctor Lloyd for the development of the Bureau during the period from 1926 to 1938, when he retired from the Service. During this period he

continued the publication of the *Pan American Sanitary Bulletin* and increased its distribution to 9,000 physicians and health officials in Latin America. He helped to organize and took part in several Pan American Sanitary Conferences. At the request of Surgeon General Cumming Doctor Lloyd remained with the Bureau several months after his official retirement.

Dr. John D. Long became interested in the Bureau in 1923-1924 when he helped draft the Pan American Sanitary Code which was approved by the Conference in Havana in 1924 and later ratified by all 21 of the American Republics. Doctor Long was instrumental in getting several Latin American countries to ratify the Code.

This Code, which superseded the Washington Convention of 1905, covered a much wider field. The new treaty was more specific and definite in its stipulations, with respect to ships, ports, and quarantine periods, and included aircraft. Also, for the first time, provisions were added on a number of important matters, including vital statistics, the possibilities for inter-American cooperation in health and allied fields were increased, and the functions and duties of the Pan American Sanitary Bureau were finally defined and its finances placed on a solid basis.

From 1929 when Doctor Long became the first Traveling Representative of the Bureau until he retired in 1949, he devoted his entire time to improving health in the Americas. He assisted in drafting national health codes for Chile, Panama, and Uruguay, which were adopted by these countries and utilized by other countries in drafting their own health codes.

The work for which he was best known was in the field of plague control. To Doctor Long is due the credit for assisting several South American countries in eliminating plague from their principal ports and in reducing the number of plague foci and human cases of plague.

Doctor Long's efforts in public health were not confined to plague. He advocated and assisted countries in practicing preventive medicine and improving environmental sanitation, obtaining safe water supplies and in enriching the diets of the people. He wielded a splendid influence at sanitary conventions and was recognized by Secretary of State Cordell Hull and other statesmen as a diplomat of a high order. He was a leading proponent of Pan Americanism.

Dr. John R. Murdock was detailed to the Bureau in 1937. The primary objective of his assignment was to have a younger officer in the Public Health Service trained in yellow fever. Most of the officers in the Service who had worked with yellow fever during outbreaks in the United States and later in South America had retired. Developments in aviation shortening the travel time between international airports, coupled with the recent discovery of the jungle form of yellow fever, increased the threat of the spread of the disease and its possible reintroduction into the United States. The Service decided to prepare for any possible emergency by training younger officers for yellow fever control.

In 1937 Doctor Murdock was sent to Brazil, where he worked with the Rockefeller Foundation and the Brazilian Health Service in the laboratory and field phases of yellow fever. In October 1938, he was detailed as adviser to the National Department of Health of Ecuador on plague control. Prompt action in eliminating each newly discovered plague focus resulted in the eradication of plague in Guayaquil. No plague, either human or rat, has been reported from there since April 1939.

In 1940, Doctor Murdock organized the Regional Office of the Bureau in Panama City to serve Mexico, Central America, Colombia, Venezuela, Cuba, Haiti, and the Dominican Republic. While in charge of this office, he assisted Venezuela, the Dominican Republic, Haiti, and the Central American Republics in questions concerning public health. He began the sanitary survey of sites along the section of the Pan American Highway between Laredo, Texas, and the Canal Zone; organized the onchocerciasis research and control program in Mexico and Guatemala and cooperated with others in developing the health program of the Institutes of Inter-American Affairs; and, aided by a sanitary engineer of the Service, Walter N. Dashiell, he gave assistance to the Dominican Republic in organizing and developing its malaria division.

In November 1943, Doctor Murdock returned to Washington to take charge of the field activities of the Pan American Sanitary Bureau. In 1944, upon the death of Dr. Edward C. Ernst, Doctor Murdock became Assistant Director of the Bureau, which position he was still holding in 1950.

Dr. Edward C. Ernst replaced Doctor Lloyd as Assistant Director of the Bureau in 1937. He assisted in developing the Health Division of the Institute of Inter-American Affairs and was instrumental in starting nursing schools in Latin America for the Bureau. Doctor Ernst obtained funds from the State Department for starting programs known as "Cooperation with American Republic Projects."

Dr. Joseph S. Spoto was assigned to the Bureau in 1942. He established an office at El Paso, Texas, to coordinate health activities along the United States-Mexico Border. He was instrumental in organizing the United States-Mexico Border Public Health Association. In 1946 Doctor Spoto replaced Dr. Anthony Donovan as Director of the Regional Office in Guatemala.

Sanitary Engineer Walter N. Dashiell was assigned to the Pan American Sanitary Bureau in 1940 to assist Doctor Murdock in the Caribbean and Gulf Region. When the Regional Office was moved from Panama to Guatemala City, he was the Assistant Chief of the Office and often directed its activities. Mr. Dashiell was transferred to other duties in 1947.

Another sanitary engineer of the Service, Edward D. Hopkins, served with the Pan American Sanitary Bureau from 1937 to 1947. In the devastating earthquake in Chile in 1939, he assisted the Chilean authorities in preventing outbreaks of communicable diseases. It is stated that the typhoid fever rate after the earthquake in the affected zone was less than the rate prior to the disaster due in a great part to the work of Mr. Hopkins. He assisted in organizing two schools of sanitary engineering, one in Santiago, Chile, and one in Lima, Peru. He was the first to use flame throwers to kill rats and fleas in the control of plague, and he initiated the industrial hygiene programs in the mines of Peru.

During 1942 and 1943, the Public Health Service assigned a group of medical, sanitary engineer, and scientist officers to the Pan American Sanitary Bureau for cooperative work with the Health Departments of Mexico and the Central American countries of Guatemala, Salvador, Nicaragua, Costa Rica, Panama, and Honduras.

For the main part, these officers constituted two groups which began survey operations at either end of the Pan American Highway. The

work of these groups consisted of making complete medical care and environmental sanitation surveys of cities and towns, approximately 200 miles apart along the entire route of the international highway. The results of these surveys were made available to the various countries concerned and to the Institute of Inter-American Affairs. The field parties were led from time to time by Dr. Hiram J. Bush, Dr. Robert E. Rothermel, Mr. Walter N. Dashiell and Mr. J. Lynne Robertson, Jr. Besides seeing duty along the usual traveled routes, it was often necessary for these officers to carry out their duties in remote areas along rough and uninhabited country.

In later years, these surveys, prepared in both English and Spanish have served as a basis for sanitary improvement in approximately 40 cities and towns which the parties visited.

Sanitary Engineer Donald L. Snow was detailed to the Pan American Sanitary Bureau in 1941. His first assignment was with Dr. John D. Long at the Regional Office in Lima, Peru. Mr. Snow assisted Mr. Hopkins in environmental sanitation with special reference to malaria control. Both of these sanitary engineers became interested in the automatic disinfection of aircraft and began the development of an automatic apparatus. In order to perfect the apparatus, Mr. Snow was transferred to Washington in 1944. Working in close cooperation with medical officers, sanitary engineers, and other scientists at the National Institute of Health, Mr. Snow developed an automatic disinfecting system which could be built into new aircraft or installed in old craft. It was tested and approved by the United States Navy. Sanitary Engineer Ralph J. Van Derwerker succeeded Mr. Snow in November 1948, and served until July 1949.

Pan American Sanitary Bureau Becomes Regional Office of World Health Organization

At the International Health Conference held in New York City June 19 to July 22, 1946, the delegates decided that the Pan American Sanitary Bureau should become:

The Pan American Sanitary Organization represented by the Pan American Sanitary Bureau and the Pan American Sanitary Conferences, and all other inter-gov-

ernmental regional health organizations in existence prior to the date of signature of this Constitution, shall in due course be integrated with the Organization. This integration shall be effected as soon as practicable through common action based on mutual consent of the competent authorities expressed through the organizations concerned.

At this Conference many new leaders in international health came into prominence. Doctor Cumming could see the development of a new era and he therefore decided to leave its growth and development to younger men. Following this Conference, he decided to retire as Director of the Bureau.

Dr. Fred L. Soper of the Rockefeller Foundation, whose accomplishments in public health and in the eradication of insect vectors of diseases were well-known, was unanimously elected to succeed Doctor Cumming at the Twelfth Pan American Sanitary Conference held in Caracas, Venezuela, January 12-24, 1947. Doctor Soper took over the direction of the Bureau on February 1, 1947.

Surgeon General Thomas Parran was Chief of the American delegation to the Twelfth Pan American Sanitary Conference held in Caracas, Venezuela, in January 1947. At this Conference it was agreed that the Pan American Sanitary Bureau should continue to function in its continental character in American aspects of health problems and should act as the regional office of the World Health Organization in the Western Hemisphere.

Health Section of the League of Nations

Under Article 23 of the covenant of the League of Nations, it was provided that member States of the League "will endeavor to take steps in matters of international concern for the prevention and control of disease." In April 1920, an assembly of public health experts decided to appoint a temporary "Epidemic Commission" under the direction of Dr. Norman White of England to deal with the immediate problem of controlling epidemics which were spreading in Russia and in Eastern Europe. Meanwhile, a "Provisional Health Committee" was established at Geneva. This Committee prepared a plan for the Health Organization of the League which was formally adopted by the Fourth Assembly of the League in September 1923.

Although the United States originally favored the absorption of the International Office of Public Health by the League, this action was later prevented because of the failure of the United States to ratify the Treaty of Versailles and become a member of the League. Indirectly, however, through the United States membership on the Permanent Committee of the International Office, Surgeon General Cumming became a member of the Advisory Council of the Health Section of the League of Nations.

The Health Section took steps to assist in the control of the spread of epidemics; in cooperation with the International Office of Public Health of Paris, improved the world-wide epidemiological reporting system; in cooperation with governments, initiated research in the control of communicable diseases; established standards for biologic products; commenced studies of basic underlying conditions of health, such as nutrition; and rendered assistance to governments requesting it in reorganizing and improving their public health services. Edgar Sydenstricker, an especially qualified statistician of the Public Health Service, was assigned by Surgeon General Cumming to the League at Geneva for a year or more to develop the system of reporting epidemiological information on a world-wide basis.

In the mid-twenties the work of the League had expanded sufficiently to lead a number of countries to raise the question of abolishing the International Office of Public Health and having its functions absorbed entirely by the League. When more than 60 nations convened in Paris in May 1926 to develop a new sanitary convention, this was one of the principal issues confronting the delegates.

The second prominent issue concerned the definition of an "infected" area or port and the conditions under which countries would be obligated to cease protective measures. The countries of Western Europe with large shipping interests held that the quarantine action of any signatory power should be determined by information provided by the suspected country. Speaking for the United States, Surgeon General Cumming maintained that in the last analysis the International Convention (treaty) and quarantine measures are intended to prevent the spread of disease, and that it rests with each country to determine from its own standpoint the measures to be taken in its ports. The European group

contended that since all treaties must rest upon absolute mutual international confidence, the American position was untenable but it prevailed.

WORLD WAR II AND THE HEALTH SECTION OF THE LEAGUE

The Health Section of the League remained in Geneva during World War II and the work of the International Office was greatly curtailed as the result of the German occupation of Paris. By June 1940, the staff of the Health Section had been so depleted that it included only two qualified members, Dr. R. Gautier and Dr. Y. Biraud. During the war Doctor Gautier visited Washington to aid in the development of plans for postwar relief. When the United Nations Relief and Rehabilitation Administration was created in 1943, however, it assumed most of the disease-reporting functions of both of these organizations. The Germans did permit some communication between the International Office in Paris and its branch, which was established in Royat in unoccupied France. The Royat station was able to maintain telegraphic communication with Geneva. In this way the International Office did receive and transmit epidemiological information, but it was slow and became progressively less and less satisfactory. By agreement, the International Office authorized the Health Section of UNRRA to assume the functions of the International Office in that part of the world not controlled by the Germans.

This agreement was formalized in 1944 by the Sanitary Conventions of that date which amended the International Maritime Sanitary Convention of 1926 and the International Aerial Sanitary Convention of 1933.

These new conventions took into account the recent advances in the sanitary sciences, principally the utilization of protective vaccination against yellow fever. Twenty-five nations, including the United States, became parties to the Maritime Convention and 24 nations, including the United States, to the Aerial Convention. These Conventions were temporary war measures, which were to have been terminated at its conclusion. The Protocols of 1946, however, have extended them indefinitely. The World Health Organization is now completing work on new international sanitary regulations which are expected to be adopted later.

The Office of Foreign Relief and Rehabilitation Operations set up by the Department of State included an Advisory Committee on Health and Medical Care under the chairmanship of Surgeon General Thomas Parran. In addition, the Lend-Lease Administration made an estimate of drugs and medical supplies that might be needed for relief. This work was preparatory to the formation of UNRRA. In June 1942, the United States proposed the creation of UNRRA in order

> . . . to provide for the liberated populations aid and relief from their sufferings, food, clothing and shelter, aid in the prevention of pestilence and in the recovery of the health of the people, and for the preparation and arrangements for the return of prisoners and exiles to their homes, and for assistance in the resumption of the urgently needed agricultural and industrial production, and the restoration of essential services.

Meanwhile, the Public Health Service was continuing to develop plans for a new international health agency. Early in 1945, Surgeon General Thomas Parran informed the Department of State that in the opinion of the Public Health Service the draft charter of the United Nations did not adequately provide for the creation of an international health organization. In a letter, in January 1945, the Department of State stated that it looked to the Public Health Service for advice and aid in international health affairs and requested the detail of an officer to organize an International Health Affairs Branch in that Department. In response to the request, Dr. Louis L. Williams, Jr., was detailed to the Department of State from the Public Health Service. He organized the Health Branch in February 1945. In March, he was joined by Dr. James A. Doull and in August, by Dr. H. van Zile Hyde.

Immediately they commenced work on proposals for a draft constitution for an international health organization. Mr. Howard B. Calderwood (later to be the expert on International Health Organization for the State Department) joined the Public Health Service in April and was added to the staff, as was Dr. Michael B. Shimkin.

After frequent conferences with Surgeon General Parran and other experts in the Public Health Service and in the Department of State, the draft was subjected to an intense analysis by the Health Advisory Committee, a distinguished group of 40 civic leaders and health and medical experts.

Preparation was also started for appropriate action at the San Francisco meeting in June of the United Nations Conference for International Organization. Informal discussions were held with representatives of other interested nations, and at the San Francisco meeting the United States delegation supported the proposal of Brazil which placed "health" in the appropriate section of the Charter of the United Nations.

The Economic and Social Council (ECOSOC) of the United Nations sponsored an International Health Conference held in New York City during the summer of 1946. To prepare for the conference ECOSOC also called a Technical Preparatory Committee of 18 to meet in Paris during March and April of that same year. Surgeon General Parran was the U. S. Member and Doctors Doull and Hyde accompanied him. The proposal submitted by Doctor Parran was in the greatest detail and was chosen as the Committee's basis for discussion. The report of the Preparatory Committee showed acceptance of principles laid down in these documents, expanded them in some detail, made a number of additions, analyzed the debate of moot points, and left the solution of some of the problems to the Conference. At the International Health Conference held in New York City, June 19-July 22, 1946, the majority of the provisions of the Preparatory Committee's report, after some clarification and further expansion, were adopted.

The International Health Conference that convened in New York City on June 19, 1946, marked the beginning of a new era in health cooperation. The Conference was attended by representatives from all the member States of the United Nations as well as by observers from 13 States which were not members.

At the second meeting on June 20, Surgeon General Thomas Parran, chairman of the United States delegation, was unanimously elected president of the Conference. Other United States delegates were Dr. Martha M. Eliot, associate director of the Children's Bureau, Department of Labor; Dr. Frank G. Boudreau, director of the Milbank Memorial Fund; Dr. James E. Paullin, of Atlanta, Georgia, former president of the American Medical Association; and Mr. Durward V. Sandifer, Chief, Division of International Organization Affairs, Department of State. The chief technical adviser was Dr. Louis L. Williams, Jr.,

Chief, Health Branch, Division of International Labor, Social, and Health Affairs, Department of State.

At the closing session on July 22, the final instruments were formally approved by the Conference and signed. Because of the size and technical competence of the United States delegation, it was possible for the United States to play a vital role in all aspects of the Conference. The views of the Public Health Service were effectively supported in the framing of the final Act. This Act included a protocol providing for the absorption by the World Health Organization of the International Office of Public Health; an Interim Arrangement, creating the Interim Commission which immediately assumed the functions of the Health Section of the League of Nations and later liquidated the health operations of UNRRA;* and a Constitution, which, *inter alia,* provided for the eventual integration of the Pan American Sanitary Bureau with the World Health Organization. Thus the way was opened to reach one of the prime objectives of United States international health policy, the creation of a single world-wide international health organization.

World Health Organization

The International Health Conference created a World Health Organization Interim Commission. This Commission laid the groundwork for the establishment of the permanent World Health Organization. By April 7, 1948, the required 24 ratifications from countries which were members of the United Nations had been obtained, and the World Health Organization Constitution entered into force.

The principles upon which the World Health Organization is based are clearly set forth in the preamble to its Constitution:

> Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.
>
> The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social conditions.
>
> The health of all peoples is fundamental to the attainment of peace and security and is dependent upon the fullest cooperation of individuals and States.

*The administration of the international sanitary conventions was taken over from UNRRA on January 1, 1947.

The achievement of any State in the promotion and protection of health is of value to all.

Unequal development in different countries in the promotion of health and control of disease, especially communicable disease, is a common danger.

Healthy development of the child is of basic importance; the ability to live harmoniously in a changing total environment is essential to such development.

The extension to all peoples of the benefits of medical, psychological, and related knowledge is essential to the fullest attainment of health.

Informed opinion and active cooperation on the part of the public are of the utmost importance in the improvement of the health of the people.

Governments have a responsibility for the health of their peoples which can be fulfilled only by the provision of adequate health and social measures.

World Health Organization activities are divided into two main categories: technical services and operational services. Included in the first group are such vital functions as standardization of biologic products, unification of pharmacopoeia, and epidemiological intelligence. Other work covered by the World Health Organization's Technical Services includes international regulations on health statistics, special research projects on parasitic diseases, such as filariasis and schistosomiasis, and virus diseases, such as influenza and poliomyelitis. In addition, the World Health Organization issues a series of 15 types of technical publications and scientific works including: *Bulletin of the World Health Organization, Chronicle of the World Health Organization, Weekly Epidemiological Record,* and *Epidemiological and Vital Statistics Report.*

The optional services of the World Health Organization include supplying technical assistance to areas requesting it and aiding in the training of health personnel.

There are three principal organs of the World Health Organization: The World Health Assembly, the Executive Board, and the Secretariat. The World Health Assembly is composed of delegates from the member States who meet in regular sessions to determine the broad policies of the Organization, and to develop and approve programs and budgets. The Executive Board consists of persons from 18 countries who meet at least twice a year to prepare agenda for the meetings of the Assembly, and to take action on matters demanding immediate attention. The Secretariat includes the Director General (Dr. Brock Chisholm of Canada) and the Organization's technical and administrative staff.

The delegates to the First World Health Assembly, which met in Geneva, Switzerland, in June 1948, faced vast problems in creating an effective organization and in deciding on methods of reaching objectives. In order to permit the World Health Organization to deal effectively with the specific needs of various regions, it was decided to create six regional organizations to serve the following areas: Eastern Mediterranean, Western Pacific, Southeast Asia, Europe, Africa, and the Americas. Regional offices have now been established in New Delhi, India, and Alexandria, Egypt, for Southeast Asia, and the Eastern Mediterranean region, respectively. As previously stated, the Pan American Sanitary Bureau began to serve as the Regional Office for the Western Hemisphere in 1948. A special office for Europe has been established at World Health Organization headquarters in Geneva, Switzerland. Preparatory action for organization of the Western Pacific area was taken by the Third World Health Assembly.

The First Assembly was also challenged with the problems of deciding on a realistic program. Faced on the one hand by a staggering need for health assistance in many areas of the world, the Assembly had available only $5,000,000 for its first year's budget. In order to solve this problem, it was decided to give priority attention to certain of the more urgent health problems. Malaria, maternal and child health, tuberculosis, environmental sanitation, and nutrition were given top priority.

Surgeon General Parran headed the United States delegation to the Assembly. Other members of the delegation were Dr. Martha M. Eliot, then Associate Chief of the Children's Bureau, and Dr. James B. Miller, of Hartford, Connecticut, a Trustee of the American Medical Association. Doctor Eliot was named Deputy Director General of the World Health Organization in 1948.

The Second Assembly, which met in Rome in June 1949, followed the same procedure in developing programs. The reports from delegates as to progress in their countries in combating disease were a high point of this Assembly and provided encouragement for pressing forward with the work. This Assembly was marked by attacks of a political nature by the East European bloc against the United States on the question of medical supplies. This group of countries felt that the World Health

Organization should furnish needed medical supplies to countries which were not able to produce them. Other delegations contended that the amount of assistance the World Health Organization could supply was infinitesimal compared with world needs and that medical supplies should be obtained through normal channels. A resolution was adopted which provided that the World Health Organization would provide medical supplies only for projects sponsored by it.

The delegation from the United States included Surgeon General Leonard A. Scheele, Chairman; Dr. Edward S. Rogers, Dean of the School of Public Health, University of California; Mrs. Louise Wright, Director, Chicago Council of Foreign Relations; Dr. James R. Miller, Vice-President of the Board of Trustees, American Medical Association, Hartford, Connecticut; Dr. H. van Zile Hyde, of the Public Health Service; and Howard B. Calderwood of the Department of State.

WORLD HEALTH ORGANIZATION—PAN AMERICAN SANITARY ORGANIZATION AGREEMENT

The establishment of regional organizations as parts of the World Health Organization by the World Health Assembly is provided for in Chapter XI of the Constitution of the World Health Organization. Article 54, Chapter XI, of the Constitution provided for the integration of the Pan American Sanitary Organization represented by the Pan American Sanitary Bureau and the Pan American Sanitary Conference with the World Health Organization.

The First World Health Assembly (1948) delimited the geographical areas with a view to the establishment of regional organizations in the areas. The American Area was delimited as comprising the Americas. Thus, in accordance with a resolution of the Twelfth Pan American Sanitary Conference at Caracas, Venezuela, January 1947, and authorizations given by the Executive Committee of the Pan American Sanitary Organization at its Fourth Meeting in Washington, May 1948, and by the Executive Board of the World Health Organization given at its Second Session, Geneva, July 1948, the Director of the Pan American Sanitary Bureau signed a Temporary Working Agreement, dated February 1, 1949, with the Director-General of WHO, to take effect on March 1, 1949. On May 1, 1949, the functions and staff of the New York

Office of WHO, with the exception of liaison with the United Nations and Specialized Agencies, were transferred to the Bureau in Washington.

On April 22, 1949, Uruguay became the fourteenth American State to ratify the Constitution of WHO. This ratification fulfilled the stipulation of the Twelfth Pan American Sanitary Conference that 14 American States should ratify the Constitution before the final agreement between PASO and WHO could be concluded. On May 24, 1949, the Director-General of WHO and the Director of the Pan American Sanitary Bureau on behalf of the Pan American Sanitary Conference, signed the Agreement, the terms of which had been approved by the First World Health Assembly and by the Directing Council of PASO at its Second Meeting in Mexico City, October 1948.

Under the terms of this Agreement, the Pan American Sanitary Conference, through the Directing Council of the Pan American Sanitary Organization, serves as the Regional Committee, and the Pan American Sanitary Bureau as the Regional Office of WHO in the Americas. The Director-General of WHO attended the VII meeting of the Executive Committee of the Pan American Sanitary Organization, held in Washington in May 1949, and the meetings of the Directing Council and of the Executive Committee, held in Lima, Peru, in October 1949. The Directing Council acted for the first time as Regional Committee of the World Health Organization in October. On June 7, 1949, communications were addressed to the Ministers and Directors of Health of the American States requesting that future communications to the World Health Organization be channeled through the Pan American Sanitary Bureau with a view to facilitating the fulfillment of the Bureau's duties to the American States.

The Second World Health Assembly on June 30, 1949, approved the Agreement and declared it in effect from July 1, 1949, the Agreement taking the place of the temporary working arrangement which was officially in force since March 1, 1949, and in effect actually from May 1, 1949.

At the time the Third World Health Assembly convened in Geneva, Switzerland, in May 1950, the World Health Organization had completed its organization. The Assembly was concerned principally with further developing the programs along agreed lines of approach. There

were no delegates present from the East European countries. Letters of withdrawal had been received from Albania, Bulgaria, Czechoslovakia, Hungary, and Rumania in addition to those received the previous year from the three Soviet Republics. Poland, the only remaining member of the Soviet bloc, sent no delegation. The resignation of the Republic of China had been received a short time before the opening of the Assembly. These resignations were noted but not accepted.

Definite plans for the preparation of International Sanitary Regulations were adopted. These regulations are designed to replace and simplify the existing sanitary conventions and should put to an end the existing confusion regarding vaccination requirements for those who travel abroad. It is expected that the Fourth World Health Assembly will be in a position to adopt the regulations which will become binding on all member States unless objections are raised within the specific time limit that is fixed.

The Assembly endorsed the central technical services being provided by the World Health Organization as of the highest importance. These include the daily broadcast from 30 radio transmitters throughout the world warning of outbreaks of pestilential disease. National health services, as well as ships and aircraft, are thus warned in time to take steps to avoid the spread of communicable diseases.

UNOFFICIAL ORGANIZATIONS IN INTERNATIONAL HEALTH

Two private institutions which have been of great importance in international health work are the Rockefeller Foundation and the League of Red Cross Societies. The Public Health Service has maintained friendly relations with both of these organizations whose work has been carefully coordinated with the activities of government health programs, both nationally and internationally.

The International Health Commission of the Rockefeller Foundation was established in June 1913 to promote "public sanitation and the spread of knowledge of scientific medicine with the world as its field." Funds for its operation are provided by the Rockefeller Foundation, endowed by John D. Rockefeller with $100,000,000 and chartered by the State of New York. The Foundation has been instrumental in dealing with both emergency and chronic disease problems throughout the

world, both through its own efforts and through contributions to the League of Red Cross Societies Health Organization.

The League of Red Cross Societies should not be confused with the International Red Cross Committee, which is an independent institution staffed by Swiss citizens and acting in various humanitarian capacities in times of war. The purpose of the League of Red Cross Societies, on the other hand, is to encourage relief of suffering humanity by collaborating with organizations working to improve health and prevent disease. The League was founded in 1919 at a conference in Cannes, France.

Division of International Health

The United States foreign policy in the field of health is aimed, first, at preventing the introduction of communicable diseases into this country, and second, at aiding the economic development of other nations through encouraging the development of strong national health services.

In keeping with this objective, the Office of International Health Relations was established during the summer of 1945 under authority of the Public Health Service Act of July 1, 1944. It was organized by its first director, Dr. James A. Doull, primarily to administer the overseas projects of the Service such as the Mission to Liberia and a growing fellowship training program. Subsequently, the functions of the Office were expanded as follows:

> This Office supervises and coordinates all activities of the Service in the international health field. It maintains liaison with agencies in this field; represents the Service in international health conferences; directs a program of international exchange of health personnel and education material; drafts sanitary conventions and regulations, and health reports required by international agreements; collects and distributes data relating to foreign medical and health institutions; supervises special health missions to foreign countries; and advises the State Department, upon request, regarding plans, programs, and policies in connection with the World Health Organization. The Office advises the Surgeon General on international health matters.

In November 1949, the official designation of the unit was changed from the Office of International Health Relations to the Division of International Health.

In November 1948 Dr. Louis L. Williams, Jr., assumed direction of the Division in addition to his duties in the Department of State, thus

bringing the activities of the two offices into a single program. This unity had been growing for some time. Dr. Hyde, while Assistant Chief in both offices, had been Alternate to Doctor Parran while he was a member of the Interim Commission of the World Health Organization and, as such, represented the United States at most of the meetings. When the World Health Organization came into being (April 7, 1948) Doctor Hyde was appointed by the President to be the United States Representative on its Executive Board. The office for the United States Representative was set up in the Division of International Health.

On February 15, 1950, Doctor Hyde was detailed, upon request, to be Director of the Division of Health and Sanitation of the Institute of Inter-American Affairs. He thus brought the point of view of the multilateral health agency, the World Health Organization, into the deliberations of the largest United States bilateral health agency, the Institute of Inter-American Affairs. Dr. Frederick J. Brady then succeeded Doctor Hyde as Assistant Chief of the Division of International Health and also became Alternate on the Executive Board of WHO. These steps furthered the United States objective of integrating its international health program.

First under the American Mission for Aid to Greece and continued by the Economic Cooperation Administration, the Division of International Health organized, and staffed with Service officers, the public health division of the Mission in Greece under the direction of Dr. Oswald F. Hedley. A similar Mission is now (1950) under formation in Turkey under Dr. Frederick W. Kratz.

In his inaugural address in January 1949, President Truman proposed the Point Four program of technical assistance for underdeveloped areas to aid these regions with the expert "know-how" of the United States. "For the first time in history," the President said, "we possess the knowledge and the skill to relieve the suffering of these people." Congress enacted the authorizing legislation for the Point Four program in May 1950, and appropriated $34,500,000 in September 1950* for the first year's activities. Under this program, a number of vital health projects are planned. Some of the health projects will be carried out by the World Health Organization and others by the United States in

*Public Law 535, 81st Congress.

direct aid to individual nations. The Pan American Sanitary Bureau will undertake the health activities of the Organization of American States.

In addition to Point Four, the Economic Cooperation Administration began sponsoring in mid-1950 a series of emergency economic assistance measures in Southeast Asia and other regions in an effort to have an immediate impact on the peoples of these threatened areas.* In these programs public health and disease control have been assigned a prominent role. The Economic Cooperation Administration programs differ from the Point Four programs principally in their emphasis on providing supplies as well as technical "know-how" and on the types of operations in which relatively quick and dramatic achievements are possible. Under both types of programs, it is planned, nevertheless, to extend the health work to the development of strong national health services.

The Public Health Service is responsible for the staffing and direction of teams of specialists to carry out the health projects under both the Point Four and Economic Cooperation Administration programs. In addition, the Service may be called upon to help recruit United States health experts to participate in the multilateral programs of the World Health Organization which will be expanded under the United Nations' technical assistance programs, originated as an integral part of the Point Four operation, as well as for the Pan American Sanitary Bureau.

PATTERN DEVELOPS

A pattern is beginning to emerge for the administration and professional guidance of the bilateral programs. In most cases, the recipient government discusses with the American Ambassador or Minister in that country the possibilities of receiving assistance, either in health or in a number of technical fields. A formal note is then presented to the United States Government, through the Ambassador, asking for the specific types of missions. This is transmitted by the Embassy to the Department of State or, in Southeast Asia, to the Economic Cooperation Administration. A request then goes to the Public Health Service to participate in the program. The Division of International Health develops a staff study of the health aspects of the proposed project in the

*Public Law 329, 81st Congress.

recipient country. Based on the recommendations of the staff study, a detailed project plan is developed, including personnel and budgetary estimates. This is presented to the Department of State as a recommendation of the Public Health Service as to the type of program to be conducted in the area. When this project plan is approved and funds allocated, the Division proceeds to recruit personnel to carry on the program. Great care is given to the selection of these specialists to assure that they not only are experts in their respective fields, but possess the highest qualities of leadership and judgment, the ability to work cooperatively with others, and to adapt to different cultural environments.

Mission to Liberia

In January 1944, the President-Elect of the Republic of Liberia requested the President of the United States to render such aid as might be available to assist the Liberian Government in the solution of many of its major health problems, especially certain preventable diseases which were seriously handicapping the economic and social development of the country. Malaria, infections of intestinal parasites, dysenteries, and in certain parts of the country schistosomiasis, filariasis, and trypanosomiasis were highly prevalent. Maternal and infant mortality rates were exceedingly high. Periodically epidemics of smallpox occurred with disastrous results.

To combat these diseases, there were only six physicians, two dentists, and four graduate nurses in the country. Scattered throughout the country were six small hospitals with a total bed capacity of less than 230. With the exception of the hospitals of the Firestone Rubber Company, totaling 100 beds, these institutions were inadequately staffed and equipped. The Liberian Government and the missionary religious groups operated six outpatient clinics at various points in the Republic; there were no pharmacists or drugstores in the country. A part-time physician with several clerical and subprofessional assistants constituted the headquarters staff of the Bureau of Public Health and Sanitation. There was one full-time physician attached to the Government hospital at Monrovia. Such were the medical and public health facilities for an estimated population of 1,500,000 people.

In response to the request from the Republic of Liberia, on March 28, 1944, the Department of State, with the endorsement of the War

Department, requested the Public Health Service to dispatch a Mission to Liberia. This Mission was directed

> . . . to perform extra-military sanitation in cooperation with the Government of Liberia for the protection of United States military personnel, including such sanitation works as may be necessary in other areas which may affect their health; to render the environs of airports free of exotic mosquito species dangerous to the United States if introduced; to advise the Liberian Government in planning for the sanitation of coastal towns; and to render such aid as may be requested by the Liberian Government in the enlargement of its public health program.

In October 1944, the Liberian Mission was organized under the direction of Senior Surgeon (R) John B. West who had been active both in appraising the health conditions in Liberia and in preparing preliminary plans and programs for the Mission. A group of four persons arrived in Monrovia in November 1944. Shortly thereafter this group was reinforced with the arrival of Surgeon (R) Charles West, Dental Surgeon (R) Louis R. Middleton, Assistant Nurse Officers (R) Theresa Colwell, Virginia Ford, and Hazel Birch, and Assistant Sanitarian (R) Alma Jackson.

About this same time, the Office of Cultural Affairs of the Department of State assigned two Nursing Arts Instructors, Misses E. Vashti Hall and Inez B. Butler, to Liberia for the purpose of assisting the Mission in developing a training school for Liberian nurses.

The maximum strength of the Mission was reached in 1947 when 21 professional and technical persons were on active duty with the Mission. In November 1948, Senior Surgeon (R) Hildrus A. Poindexter replaced Doctor West as Director of the Mission.

Because of the meager facilities available in Monrovia, it was necessary for the Mission to establish itself on an almost completely self-contained basis. This involved the construction of a compound including an administration and clinic building, warehouses, garages, repair shops, and other miscellaneous buildings. Also, it was necessary for the Mission to provide its own electrical plant, water supply, telephone system, and other utilities. The Mission has recently completed the construction of a nurse training school building. All construction has been the joint enterprise of the Liberian Government and the Mission.

The major accomplishment of the Mission has been the assistance given the Liberian Government in developing its Bureau of Public

Health and Sanitation. The evidence of this is seen in the fact that the Liberian budget for the Bureau of Public Health and Sanitation is now approximately 500 percent higher than it was in 1944. Ten percent of the national budget is now devoted to health services.

In cooperation with the Bureau of Public Health and Sanitation, the Mission operates a large general clinic and specialized clinics in maternal and infant care, pediatrics, tropical ulcers, and venereal diseases. The general clinic has over 2,000 admissions per month. The Mission has established the only public medical library in the country. It operates for the Liberian Government a general and two specialized diagnostic laboratory services for the clinics, local hospitals, practitioners, near-by schools, and church missions. It provides the only X-ray facilities in the country available to the general population.

As a result of the joint immunization campaign with the Liberian Government, smallpox, which formerly occurred in epidemic waves, is now under control. Together with the Government, the Mission operates an efficient malaria control program for the capital, the port area, and, to some extent, the airport area. Because of the social and economic importance of certain diseases, the Mission has conducted survey activities covering the incidences, geographical distribution, and factors of spread of the major causes of morbidity and mortality in the Republic. It now has available information on the epidemiology of malaria, the diarrheal and dysentery diseases, treponemiasis, trypanosomiasis, intestinal helminthiasis, schistosomiasis, filariasis, tropical pyodermas, leprosy, dermatomycosis, and tuberculosis.

The nursing school established by the Mission provides the most complete course of training available in the Republic. Other training schools are gradually becoming affiliated with the school for the purpose of providing additional instruction for their trainees. A midwifery training program has been organized for the native midwives. Also, a training program for medical technicians and sanitary inspectors is provided.

In addition to its public health and environmental sanitation activities, the Mission conducts on a limited scale certain research studies. It operates an experimental animal colony and serves as a collection and shipping agency for important specimens and animals, specifically snails, chimpanzees, and Strophanthus plants, for research activities in the National Institutes of Health and the Department of Agriculture.

Land of the Queen of Sheba

During the spring of 1946, Dr. Oswald F. Hedley, at the request of the Department of State, was detailed as senior medical officer on the Special Diplomatic Mission to the Kingdom of Yemen.

Yemen is an independent kingdom located in the southwestern part of the Arabian peninsula on the Red Sea, North of Aden. It is one of the few remaining absolute monarchies and is a moslem stronghold forbidden to non-believers except on special invitation of the Imam. It is doubtful if more than a dozen Americans had ever visited Yemen prior to 1946. Historically, Yemen is of considerable interest as it was the homeland of the Queen of Sheba and the locality where coffee was first grown. Mocha, from which coffee was for many years exported, was formerly a flourishing Red Sea port but is now in ruins.

In addition to his duties as senior medical officer for the Mission, Doctor Hedley made observations on disease conditions in that unknown land where about 3,500,000 persons receive virtually no medical care. On special request, he attended His Majesty the Imam Yahya, then 83 years old, and members of the royal household. As a result of the Mission in which a Service officer participated, diplomatic relations were established between the United States and the Kingdom of Yemen.

Mission to Greece

In February 1947, the United States was advised that the British were no longer in a financial position to render further economic assistance to the Kingdom of Greece. In view of the important economic, diplomatic, and strategic location of Greece, which was at that time fighting a civil war against communism, the United States decided to render economic and military aid to that hard-pressed nation.

A mission, first known as the American Mission for Aid to Greece, was organized under the Department of State and consisted of military and economic advisers. A year later with the advent of the Marshall Plan, the civilian components of the Mission were made a part of the Economic Cooperation Administration Mission to Greece.

At the request of the Department of State, a small public health advisory group was assigned to the American Mission for Aid to Greece in

July 1947. This group consisted originally of Medical Director Oswald F. Hedley, Senior Sanitary Engineer Vernon G. MacKenzie, and Senior Nurse Officer Mary E. Forbes. From this small nucleus developed the Public Health Division of the American Mission for Aid to Greece and subsequently of the Economic Cooperation Administration Mission to Greece. At its maximum strength, the Division consisted of 15 commissioned officers of the Service, eight Economic Cooperation Administration personnel, and some 40 Greek personnel. Service personnel included medical officers, nurse officers, sanitary engineer officers, a biostatistician, a veterinary officer, and a construction engineer. Other personnel included hospital administrators, health educators, medical supply experts, and administrative personnel.

The duties of this group were manifold. They included the construction and rehabilitation of hospitals, health centers and sanatoria, the construction of water supplies, supervision of the medical care of 700,000 refugees, the reorganization of the Ministry of Hygiene, a training program, tuberculosis control, and a continuation of the malaria control program begun by United Nations Relief and Rehabilitation Administration and the World Health Organization. Difficulties of supply were overcome despite the civil war which necessitated the moving of supplies by convoy and even resorting to dropping by parachute on exceptional occasions.

The Public Health Division contributed in many ways toward the successful termination of hostilities and the economic recovery of Greece. Malaria, which had figured in the decline of ancient Greek civilization and had been for many years its major public health problem, was kept under control. The tuberculosis death rate which rose to almost epidemic proportions during World War II was reduced below the prewar level. The establishment of directorates of nursing and sanitary engineering in the Ministry were among the improvements made in public health administration.

The success of these public health activities in Greece demonstrated the importance of public health to economic development. Subsequent requests for the assignment of Public Health Service personnel have been received from Missions to Iran, Turkey, Indo-China, Indonesia,

Thailand, and other places. In effect, the success of the Public Health Division of the Economic Cooperation Mission to Greece has served as a spearhead for Point Four and other international health activities. This Mission demonstrated the concept of the utilization of public health practices as an instrumentality of statecraft.

Mission to Iran

At the request of the Imperial Iranian Government, Scientist Director Justin M. Andrews and Sanitary Engineer Lawrence B. Hall of the Public Health Service were assigned to give assistance in planning a national malaria control program in Iran.

If Iran (Persia) were superimposed on the United States with its northern boundary coincident with that of the State of Kansas, it would extend south to some 200 miles beyond the southern point of Texas. Its area is about one-fifth that of the United States. The population is approximately 16,000,000 persons. In recent years it is estimated that from 400,000 to 500,000 cases of malaria occur each year in that country. It is stated that no less than 40 percent of the 11,000,000 villagers live under conditions of severe malaria endemicity, and that another fifth of this population lives under conditions of mild or intermittent prevalence. Most of the malaria in Iran is probably associated with irrigation or impoundment of water.

Doctor Andrews served as adviser from October to December 1948, Mr. Hall from March to June 1949. Senior Assistant Scientist Richard Dow spent three months in Iran beginning in August 1949 to observe the relative effectiveness of recommended mosquito control methods. These officers of the Public Health Service reviewed plans prepared by the Ministry of Health of Iran and collaborated in perfecting details of plans for mosquito control and eradication of malaria. The essence of the recommendations submitted by these officers was that the control and prevention of malaria in Iran should be decentralized and based primarily on one type of activity—the prevention of the breeding of mosquitoes by using DDT, this to be supplemented as necessary by suppressive antimalarial medication.

CHAPTER VIII

Leadership and Leaders

Use three physicians: first Doctor Quiet;
Then Doctor Merry-Man; and then Doctor Dyet.
—TEXTBOOK OF SCHOOL OF SALERNO

Central Organization Established

ALTHOUGH the Marine Hospital Service was administratively in the Treasury Department from the time of its establishment in 1798 until 1939, when it was transferred to the Federal Security Agency, there was no central controlling head of the Service until 1870, when by Act of Congress the Service was reorganized and provision made for a Surgeon General to exercise over-all supervision and direction from Washington. The Surgeon General (the original title was Supervising Surgeon, then Supervising Surgeon General) was responsible to the Secretary of the Treasury from 1870 until 1939; and since that time to the Administrator of the Federal Security Agency. During the 80 years of its centralized administration the Service has been unusually fortunate in having outstanding leaders selected to head the organization. Each Surgeon General has proved to be especially fitted to handle the problems arising during his term of office, and has sponsored important health legislation.

It is obvious that each Surgeon General did not individually accomplish all of the major advances gained during his administration, but each one did furnish the leadership, vision, and understanding to guide the forces that carried public health work forward. It has been the prerogative of the Surgeon General since the creation of that office to be free to select his immediate staff. With very few exceptions the men selected by the various Surgeons General have also contributed materially to the advancement of the several activities entrusted to them for organization and development. The establishment by law in 1902

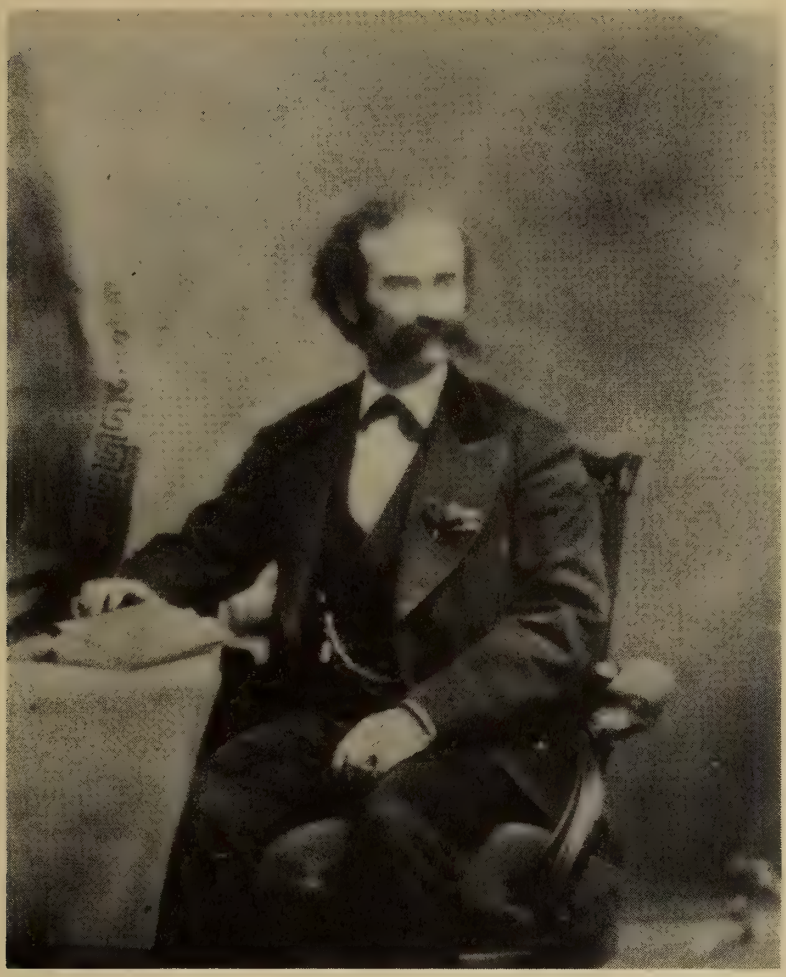
of administrative divisions of the Headquarters of the Service, and the creation of the grade of Assistant Surgeon General for officers in charge of divisions made it possible for the Surgeon General to assign especially qualified officers in the corps to duty on his staff. Surgeon General Wyman inaugurated the policy of assigning outstanding and enterprising young officers as division chiefs who carried forward the several programs with vigor.

SURGEON GENERAL JOHN MAYNARD WOODWORTH

The first step in the reorganization of the Marine Hospital Service, including the establishment of a central bureau in Washington, D. C., was the appointment by the Secretary of the Treasury of a Supervising Surgeon. Dr. John Maynard Woodworth, at the age of 33, was appointed Supervising Surgeon in April 1871.

Doctor Woodworth was born on August 15, 1837, at Big Flats, Chemung County, New York, the family moving shortly thereafter to Illinois. He received his education at Warrenville, Illinois, and later at the University of Chicago, where he studied pharmacy and subsequently engaged in business as a pharmacist for a short time on his own account, at the same time attending lectures on materia medica and chemistry at Rush Medical College.

Significant of the quality of his mind and purposes, it is to be noted that young Woodworth took part in organizing the Chicago Academy of Science and in 1858 became curator of its museum. He devoted much time and effort to this work, making several excursions west of the Mississippi for the purpose of collecting specimens of natural history. In 1859, he was appointed naturalist by the University of Chicago and designated to establish a museum of natural history. The winters of 1859, 1860, and 1861 he passed at the Smithsonian Institution in Washington, working under the personal direction of Professor Spencer F. Baird. He subsequently began the regular study of medicine at Rush Medical College, receiving his medical degree there in 1862. After graduation in medicine he immediately entered active service in the United States Army as an Assistant Surgeon at Camp Douglas, Illinois. Shortly after that he joined the Army of General William Tecumseh



(From USPHS Records)

Surgeon General John M. Woodworth

(From USPHS Records)

Chest of surgical instruments owned by Surgeon General Woodworth.

Sherman in the field near Corinth, Mississippi, remaining with General Sherman until mustered out in 1865. In 1863 he was promoted to the grade of Surgeon and assigned to duty as Medical Inspector of the 15th Army Corps and afterward as Medical Director of the Army of the Tennessee. During the campaign around Atlanta he established field headquarters for which he was commended in general orders for his efficiency. On the "March to the Sea" he was in charge of the ambulance train and accomplished the remarkable record of bringing the sick and wounded to Savannah without the loss of a single man. He was brevetted lieutenant colonel for his meritorius services and was the recipient of two additional communications of commendation.

In 1865 he visited Europe where he spent one year chiefly in the hospitals of Berlin and Vienna, taking courses of special instruction in those institutions. In 1866 after leaving the Army he became demonstrator of anatomy in the Chicago Medical College. While demonstrator of anatomy at the Medical College he filled the chair of natural history in the University of Chicago for one year during the absence of the regular incumbent. In 1866 he was also appointed Surgeon of the Soldier's Home of Chicago and Sanitary Inspector of the Chicago Board of Health.

A man of conspicuous ability and untiring energy, eminently fitted for the work of reorganizing the Marine Hospital Service, he combined the ripe experience of the trained disciplinarian with the energy and enthusiasm of youth. Consistent with the pattern of his life he used his rare combination of abilities and attributes unsparingly in the accomplishment of his work.

In recognition of the progress that Doctor Woodworth had made in reorganizing the Marine Hospital Service, his title was changed in 1875 from Supervising Surgeon to Supervising Surgeon General. From the time of his appointment, Doctor Woodworth envisioned the Marine Hospital Service as a true national health service and felt that its health function should be extended beyond that of furnishing direct medical care.

The papers presented by him before various national and international medical meetings indicate the broad scope of his interest as shown by the following titles of his articles:

Primary Surgery of General Sherman's Campaigns (1866)
Regulations of the United States Marine Hospital Service (1873)
Hospitals and Hospital Construction (1873)
The Immigration Service of the United States (1873)
Nomenclature of Diseases (1874)
Cholera in 1873 in the United States (1875)
Migrants and Sailors and Their Relations to Public Health (1875)
Quarantine with Reference to Cholera and Yellow Fever (1876)

Doctor Woodworth devoted himself energetically to improving the organization of the Marine Hospital Service, and to laying the foundation for legislation that in 1878 resulted in the first Maritime Quarantine Act, to prevent the introduction of contagious or infectious diseases into the United States.

Among the achievements during the period that Doctor Woodworth served as Surgeon General are the following:

(1) Reorganization of the Service and coordination of its functions under one directing head.

(2) Formulation, adoption, and maintenance of a high standard of entrance examinations for medical officers of the Service. Prior to this time, physicians were appointed upon recommendation of the local Collector of Customs. As may be surmised there was strong opposition to this change.

(3) Revision and enforcement of the regulations governing the Service. These regulations adopted in 1873 discontinued the practice of appointing officers to serve in a particular locality. From that time on officers were appointed to the general Service and not to any designated stations.

(4) Inauguration of the preparation and publication of annual reports of the Service.

(5) Proposing and advancing the concept of Federal control of maritime quarantine and a definite plan for preventing the introduction of diseases through maritime traffic; he was instrumental in obtaining passage of the Quarantine Act of April 29, 1878.

(6) Introduction of improved methods of hospital construction and administration, and expanded outpatient medical care at hospitals.

(7) Direction of investigations of yellow fever epidemics and submission of a report on the disease to the Senate in response to a resolution.

(8) Initiation of the publication of Weekly Abstracts of Consular Sanitary Reports (the forerunner of the present *Public Health Reports*) as authorized by the Quarantine Act of 1878.

Doctor Woodworth was recognized as one of the leaders in the field of preventive medicine of that period. Despite the fact that he had been General Sherman's Chief Medical Officer as previously noted, his relations with the State and local health authorities of the southern States were very cordial. He enjoyed to a great measure the confidence of members of Congress and other important officials of the Government in matters relating to health. He was one of the founders of the American Public Health Association.

In June 1873, Doctor Woodworth was married to Maggie C. Hannahs, of Chicago, Illinois. He died on March 14, 1879, at Washington, D. C.

SURGEON GENERAL JOHN B. HAMILTON

The second Surgeon General of the Service was Dr. John B. Hamilton, who was born at Otter Creek, Jersey County, Illinois, December 1, 1847. He received his medical degree from Rush Medical College in 1869, and was engaged in the private practice of medicine from 1869 to 1874. He was married to Miss Mary L. Frost in 1871. From this union two children were born, one of whom became a physician, Dr. Ralph Hamilton, who for many years was Professor of Pathology at Georgetown University Medical School in Washington, D. C.

From 1874 to 1876 Doctor Hamilton served as an Assistant Surgeon in the United States Army. He resigned in September 1876 and entered the Marine Hospital Service as an Assistant Surgeon. During the next two or three years he served in charge of several Marine Hospitals. Upon succeeding Doctor Woodworth as Surgeon General on April 3, 1879, Doctor Hamilton, then 31 years of age, found himself confronted with an especially difficult situation. Although Congress had enacted the quarantine law of 1878, very shortly thereafter the National Board of Health (previously discussed) was established and that organization was given authority that appeared to duplicate or even supersede the authority given to the Service in the Quarantine Act. The National Board of Health was to expire by limitation after four years. In the

controversy that naturally arose concerning specific functions of the National Board of Health and the Service, Doctor Hamilton aroused a number of antagonisms. He also developed many strong friends.

Doctor Hamilton was an able administrator, and he continued the policies of developing the Service and strengthening the career corps. He secured the passage of the Act of January 4, 1889, creating the commissioned corps; and the Act of March 7, 1890, establishing the functions of the Service relating to prevention of the interstate spread of disease.

A man of great ability and strong personality, he had the faculty of impressing his views and opinions upon others. His manner was sometimes described as being bold and aggressive and he did not always expect his point of view to be popular. He was considered to be a formidable but fair opponent and was greatly admired for these qualities.

Among the important accomplishments during the incumbency of Doctor Hamilton as Surgeon General are the following:

(1) Further development of the national maritime quarantine system —Act of August 1, 1888.

(2) Development of the interstate quarantine system to prevent introduction of contagious diseases from one State to another, as authorized by Act of March 27, 1890.

(3) Reorganization and stabilization of the career corps of commissioned officers by the Act of January 4, 1889.

(4) Establishment of the Hygienic Laboratory (forerunner of the National Institutes of Health) at the Marine Hospital in New York in 1887 for the investigation of infectious and contagious diseases.

(5) Investigations of epidemics of yellow fever.

(6) Cooperation with and assistance to States in the control of epidemics, particularly yellow fever.

(7) Abolition of the hospital tax on American seamen.

Doctor Hamilton resigned as Surgeon General on June 1, 1891. He was reappointed as Surgeon by the President, being confirmed by the Senate on January 13, 1892. Following his reappointment he was in charge of the Marine Hospital at Chicago for several years.

(From USPHS Records)

Surgeon General John B. Hamilton

(From USPHS Records)

Surgeon General Walter Wyman

Possessed of a variety of talents and interests in the field of medicine, he filled the chair of Professor of Surgery at Rush Medical College while on duty at the Chicago Marine Hospital. He was the editor of the *Journal of the American Medical Association* from July 1893 until his death in 1898.

He resigned from the Service on November 13, 1896, and became Superintendent of the State Insane Hospital at Elgin, Illinois. While holding this position he died on December 24, 1898.

SURGEON GENERAL WALTER WYMAN

A native of St. Louis, Missouri, Dr. Walter Wyman was born August 17, 1848. He received the degree of Bachelor of Arts from Amherst College in 1870, and his medical degree from St. Louis Medical College in 1873. Upon graduation he served as Assistant Physician of the City Hospital at St. Louis for two years and engaged in private practice for an additional year. In 1876 he entered the Marine Hospital Service as an Assistant Surgeon and later served in charge of several Marine Hospitals.

In December 1888, Doctor Wyman was assigned to duty in Washington as Chief of the Quarantine Division. Appointed Surgeon General on June 1, 1891, he headed the Service for more than twenty years, providing leadership during a period of very important advances in medical science. Cholera appeared in Europe about a year after Doctor Wyman became Surgeon General. To protect United States ports from the disease, he instituted prompt and energetic measures, including the imposition of a twenty-day quarantine on all vessels bringing immigrants to this country. This resulted in an almost complete cessation of immigration for the time. Legislation enacted by the Congress following this outbreak placed additional quarantine responsibility and authority upon the Service.

Doctor Wyman was President of the American Public Health Association in 1902 and President of the Association of Military Surgeons of the United States in 1904.

Doctor Wyman's approach was one of persuasion. Although he was tenacious in his opinions and judgments, his attitude was not that of demanding acceptance. A student and a scholar, he delighted in the

classics and in the preparation of articles on public health subjects. Doctor Wyman realized quite early the importance of scientific research in public health, and initiated plans for the development of this important function of the Service. He set the precedent for quality in research and never deviated from it. In every way possible he relieved competent scientific workers of administrative and routine duty.

Doctor Wyman never married. The Service and its personnel were to him what a family usually is to a married man. He was an indefatigable worker and spent a great deal of time at his office after official hours. He had a great penchant for detail, and management experts will be gratified to know that more than fifty years ago Doctor Wyman developed a manual of procedure for use at Service Headquarters. This manual was an interesting document, and reduced to writing almost every procedural step in the handling of correspondence, accounts, appointments, and separation of personnel, publications, inquiries for information on Service functions and activities, and other administrative operations. Individual responsibility and authority in the Headquarters organization were set down in detail from routine transactions to matters involving policy, and supervisory personnel were held accountable for the application of its provisions. He was a cautious person, very careful not to commit himself on any subject until he was completely sure of his ground.

During Doctor Wyman's long tenure as Surgeon General there was notable progress in the field of public health and in expanding the work of the Service. Among the more important accomplishments during his administration may be mentioned the following:

(1) Further development of the national maritime quarantine system by the Acts of February 15, 1893, and June 19, 1906, and the extension of maritime quarantine functions to Hawaii, Cuba, Puerto Rico, the Panama Canal, and the Philippine Islands.

(2) Authorization for the medical inspection of aliens entering the United States.

(3) Assignment abroad of medical officers of the Service to prevent the introduction of pandemic diseases into the United States.

(4) Cooperation with the health authorities of the American Republics for the creation of the Pan American Sanitary Bureau in 1902 by treaty action.

(5) Cooperation with health authorities of other nations leading to the creation and maintenance under treaty ratification of the International Office of Public Health in Paris for the advancement of international sanitation.

(6) Suppression and control of epidemics and outbreaks of disease in collaboration with State and local authorities, especially plague, smallpox, and yellow fever.

(7) Inauguration of plague control in California in 1900.

(8) Inauguration of annual and special conferences with State and Territorial health authorities as authorized by the Act of July 1, 1902.

(9) Transfer of the Hygienic Laboratory from the Marine Hospital on Staten Island, New York, to Washington, D. C., with the subsequent erection of a special building and the enlargement and development of the institution and its functions.

(10) Creation of an advisory board for the Hygienic Laboratory.

(11) Authorization to license establishments producing and preparing biological products offered for sale in interstate commerce.

(12) Extension of medical services to additional groups of beneficiaries and the establishment of additional Marine Hospitals.

(13) Expansion, reorganization, and change of name of the Service from Marine Hospital Service to Public Health and Marine Hospital Service in 1902.

(14) Inauguration and conduct of systematic investigations of contagious and infectious diseases and other matters pertaining to the public health.

(15) Establishment of a leprosy investigation station in Hawaii.

Surgeon General Wyman died at Washington, D. C., on November 21, 1911.

SURGEON GENERAL RUPERT BLUE

Born in Richmond County, North Carolina, on May 30, 1867, Dr. Rupert Blue received his academic training at the University of Vir-

ginia. His medical degree was obtained at the University of Maryland in 1892.

Doctor Blue entered the Service as an Assistant Surgeon in 1893. He served on various assignments, including duty in Europe in an outbreak of cholera and later in connection with bubonic plague. He was placed in charge of the control of the outbreak of plague in San Francisco when the Service was requested to assume charge by State and local authorities. Under his direction were worked out for the first time in the United States effective methods of plague control, based upon the fact that rodents are the reservoir of plague and that the disease is spread from rodent to rodent and from rodent to man by the rat flea.

On January 13, 1912, Doctor Blue became Surgeon General. A man above average size physically, he had the desirable quality of inspiring loyalty and confidence in those with whom he was associated. Stories are told that during the time when he was Surgeon General, some rather "down-at-the-heel" individuals would occasionally visit the office assuring Doctor Blue's secretary that they were special friends. Upon inquiry it usually developed that the visitors had known Doctor Blue during the time of the plague work in California, where they had been employed as laborers or rat trappers, or in some other humble capacity. However, Doctor Blue always welcomed these visitors cordially and, despite the burdens of the day, he put them at ease and spent some time with them in friendly reminiscence.

Doctor Blue possessed a quality essential for a successful administrator —that of being able to select competent associates and to delegate to them the authority and responsibiliy for carrying out the details of tasks assigned. Among the important accomplishments during the administration of Doctor Blue may be mentioned the following:

(1) Reorganization and change of the name of the Service in 1912 from Public Health and Marine Hospital Service to Public Health Service.

(2) Inauguration of plague control work in Louisiana, Texas and Florida.

(3) Cooperative work with State and local health authorities in the prevention of the interstate spread of disease and control of epidemics.

(4) Development of field investigations of diseases of man, including sewage, water supplies, and pollution of streams.

(Portrait by Walmsley Lenhard)

Surgeon General Rupert Blue

(From USPHS Records)

Surgeon General Blue and Staff, Butler Building, Washington, D. C., 1915.

FIRST ROW (Left to right): Dr. Arthur Glennan, Surgeon General Rupert Blue, Dr. Leland E. Cofer. SECOND ROW: Drs. John W. Kerr, W. Colby Rucker, Richard A. Kearney, John W. Trask.

(5) Establishment of the stream pollution investigations laboratory at Cincinnati, Ohio.

(6) Inauguration of studies and demonstrations of rural sanitation and advocating the employment of full-time county health officers.

(7) Undertaking of systematic investigations of malaria and its control.

(8) In collaboration with State health authorities, direction of campaigns for the eradication of trachoma among inhabitants of the Appalachian and Ozark mountain regions.

(9) Establishment for the first time of quarantine facilities on the Mexican border for preventing the introduction of typhus fever 1916-1917.

(10) Acquisition of the Quarantine Stations at Boston, Massachusetts, and Providence, Rhode Island, and the inclusion of Virgin Islands stations in the national quarantine system.

(11) Inauguration of a program of venereal disease control in cooperation with State and local health authorities.

(12) Legislation enacted authorizing the establishment of the National Leprosarium for the treatment of persons afflicted with leprosy.

(13) Cooperation with military authorities during World War I in sanitation activities of areas surrounding military camps and reservations.

(14) Creation of a Reserve Officer Corps of the Service.

Doctor Blue was elected President of the American Medical Association in 1916 and served the usual term of one year. He was President of the Association of Military Surgeons of the United States for the period 1915-1917.

Upon concluding eight years of service as Surgeon General, Doctor Blue was placed in charge of Service operations in Europe, with headquarters in Paris. Later, he assumed charge of a campaign for the suppression of bubonic plague in Los Angeles in 1924.

Doctor Blue retired from active duty in 1932. He died April 12, 1948, at Charleston, South Carolina.

SURGEON GENERAL HUGH SMITH CUMMING

Hampton, Virginia, was the birthplace of Dr. Hugh Smith Cumming on August 17, 1869. His premedical education was obtained at Baltimore City College. In 1891 he was graduated in medicine from the University of Virginia. He also received the degree of Doctor of Medicine from the Medical College of Virginia in 1892.

He entered the Marine Hospital Service as an Assistant Surgeon in 1894. He married Miss Lucy Booth in 1896. They had three children, Hugh S. Cumming, Jr., of the Foreign Service of the State Department, Diana Cumming Kendrick of Sheridan, Wyoming, and one who died in infancy.

During his early life as a Service officer, Doctor Cumming spent a good deal of time at various quarantine stations in the South and on the Pacific Coast. He served for a time on immigration duty and later was detailed to Japan where he was brought into intimate touch with the diseases of the Orient.

In 1912, Doctor Cumming was placed in charge of a study of the Potomac River, a tidal stream. This important work was further enlarged by an investigation of the shellfish producing waters along the Atlantic seaboard, and a study of coastal water pollution.

During World War I he was assigned to duty with the Navy as an adviser in sanitation, and later he was sent to Europe in charge of Service activities concerned with sanitary problems of returning troops and the prevention of the introduction of typhus fever and related diseases from Europe. He was a member of the Typhus Fever Commission to Poland.

Doctor Cumming became Surgeon General on March 3, 1920. Important accomplishments during the sixteen years that he was Surgeon General were:

(1) Completion of the national maritime quarantine system by the acquisition of the remaining two quarantine stations operated by the States.

(2) Development and expansion of field investigations in public health.

(3) Modernization of the Marine Hospitals and construction of 10 new institutions replacing for the most part antiquated structures in important ports and increasing the bed capacity by approximately 1,000; establishment of a National Leprosarium at Carville, Louisiana, for the treatment of persons afflicted with leprosy.

(4) Provision of medical care for veterans of World War I until the organization of the medical department of the Veterans' Administration.

(5) Development of a plan of decentralizing to a district organization the administrative details of providing medical care for veterans of World War I; also, the assignment of Service officers to the Veterans' Administration for a period following the establishment of the Veterans' Administration.

(6) Inauguration of the plan for medical examination of applicants for immigration visas in the principal countries of origin in 1925.

(7) Expansion of research; the name of the Hygienic Laboratory was changed to National Institute of Health in 1930, authority was secured for acceptance of gifts and bequests, and the work of that organization expanded materially.

(8) Legislation to authorize admission of dentists, pharmacists, and sanitary engineers into the Regular commissioned corps.

(9) Authorization for the construction of two hospitals (one at Lexington, Kentucky, opened in 1935, and one at Fort Worth, Texas, opened in 1938) for the treatment of persons addicted to habit-forming narcotic drugs, Act of January 19, 1929.

(10) Organization of the medical service of Federal penal and correctional institutions as required by Act of May 13, 1930.

(11) Development and expansion of activities of the Pan American Sanitary Bureau.

(12) Inauguration of grants-in-aid to States for development of public health work as authorized by the Social Security Act of 1935.

A dignified, cultured gentleman of the old school, Doctor Cumming was a distinguished looking man. He made a fine impression wherever he went and whenever he was interviewed or made an address. His approach was that of persuasion and reason rather than the accom-

plishment of his ends by force of personality. With it all, he had a pleasing sense of humor.

Doctor Cumming served as President of the Association of Military Surgeons of the United States in 1924 and of the American Public Health Association in 1931. He also served for a time as Chairman of the Permanent Committee of the International Office of Public Health in Paris. For several years he was an observer for the United States at the periodic meetings of the Health Section of the League of Nations held at Geneva, Switzerland.

Doctor Cumming retired from active duty on January 31, 1936. After his retirement, he continued to serve as Director of the Pan American Sanitary Bureau until 1947. He died at Washington, D. C., on December 20, 1948, and was buried at Hampton, Virginia.

SURGEON GENERAL THOMAS PARRAN

Dr. Thomas Parran was born at St. Leonard, Maryland, on September 28, 1892. His early education was obtained in the public schools of Maryland, and he received the degree of Bachelor of Arts from St. Johns College, Annapolis, Maryland, in 1911. The degree of Doctor of Medicine was conferred on him by Georgetown University Medical School in 1915.

Doctor Parran entered the Public Health Service as an Assistant Surgeon in 1917. He married Angela Vandoren in 1918. Prior to her death in 1928, four children were born, Thomas, Benjamin, Theodore, and Richard. In 1930, Doctor Parran married Carroll Keller.

Before becoming Surgeon General, Doctor Parran had a variety of assignments. During World War I he was in charge of health activities at Muscle Shoals Dam in Alabama. Later, he was with the Veterans' Bureau for a time. He then was loaned to the Missouri State Health Department where he was in charge of a tri-State health district in Southeast Missouri, serving counties in Arkansas, Oklahoma, and Missouri. Later, he was with the State Health Department at Jefferson City, Missouri.

In 1926 Doctor Parran was appointed Assistant Surgeon General and placed in charge of the Division of Venereal Disease in Washington.

(Portrait by Walmsley Lenhard)

Surgeon General Hugh S. Cumming

(From USPHS Records)

Surgeon General Cumming and Staff, 1935.

SEATED (Left to right): Dr. John McMullen, Surgeon General Cumming, Dr. Warren F. Draper. STANDING: Drs. Ralph C. Williams, Lewis R. Thompson, Francis A. Carmelia, S. Lewis Christian, Clifford E. Waller, Walter L. Treadway; Mr. Charles E. Felton, Executive Secretary to Surgeon General Cumming.

(From USPHS Records)

Surgeon General Thomas Parran

During the four years he was in charge of this program he made outstanding progress in its development and extension to the States.

Shortly after Franklin D. Roosevelt became Governor of New York, he requested Surgeon General Cumming to detail a specially qualified officer to serve as State Health Officer of New York and to reorganize the public health work in that State. Doctor Parran was recommended for this assignment and, upon Governor Roosevelt's concurrence, he went to Albany, New York, in 1930. He continued to serve as Health Officer for the State of New York until his appointment as Surgeon General of the Public Health Service on April 6, 1936.

Among the important accomplishments during Doctor Parran's terms as Surgeon General may be mentioned the following:

(1) Strengthening of the research program of the National Institute of Health and increasing the support of research projects in non-Federal institutions. Establishment of the National Cancer Institute by the Act of August 5, 1937.

(2) Development of a national research and control program in cancer; inauguration of grants-in-aid to individuals and institutions; and establishment of fellowships.

(3) Expansion of national venereal disease control through technical and financial aid to States. The publication of his book, "Shadow on the Land," in 1937, did more to bring the venereal disease problem to public attention and discussion than any other effort theretofore made in this direction.

(4) Expansion and development of the grants-in-aid program for general public health work.

(5) Development of a national tuberculosis control program to augment voluntary activities.

(6) Stimulation of interest in mental health which culminated in the National Mental Health Act to foster research, training, and State programs of control.

(7) Securing enactment of legislation to provide for health programs for Government employees.

(8) Encouragement of legislation which resulted in passage of the Hospital Survey and Construction Act that made possible the beginning of a national network of hospital and public health facilities.

(9) Acquisition of additional land for the National Institute of Health, and initiation of plans for the first research hospital or Clinical Center of the Service. The Clinical Center is to have a capacity of 500 beds.

(10) Development and administration of a wartime Cadet Nurse Corps to maintain an adequate supply of trained nurses for the nation.

(11) Organization of the Communicable Disease Center, Atlanta, Georgia, which cooperates with State and local health departments in the study and prevention of communicable diseases.

(12) Reorganization of the Service by Act of November 11, 1943, establishing four bureaus. Codification of the laws relating to the Public Health Service into the Public Health Service Act of July 1, 1944.

Doctor Parran was elected President of the American Public Health Association in 1937. He served as President of the Association of Military Surgeons of the United States in 1938-1939.

Doctor Parran is an able, positive administrator. He is aggressive in his handling of a problem, but with it he can be patient and conciliatory. He is a very effective speaker. Once he has made a decision, he pushes forward to the accomplishment of the objectives sought. His memory and grasp of the details of the widespread operations of the Service were amazing.

Doctor Parran completed twelve years as Surgeon General on April 5, 1948. He retired from active duty on October 1, 1948, to become Dean of the Graduate School of Public Health in the University of Pittsburgh.

SURGEON GENERAL LEONARD A. SCHEELE

On July 25, 1907, Dr. Leonard Andrew Scheele was born in Fort Wayne, Indiana. He received the degree of Bachelor of Arts from the University of Michigan in 1931, and the degree of Doctor of Medicine from Wayne University School of Medicine in 1934.

(From USPHS Records)

Surgeon General Leonard A. Scheele

In 1929, while still a student, Doctor Scheele married Miss Frances K. McCormick. Mrs. Scheele holds the degree of Doctor of Dental Surgery from the University of Michigan School of Dentistry. They have three children, Alexandra Martin, born in 1938, Signe Marie, born in 1941, and Leonard Andrew Murray, born in 1947.

Doctor Scheele entered the Public Health Service on July 2, 1934, as an Assistant Surgeon. Soon after his appointment, he was detailed to quarantine duty for approximately two years, serving at San Francisco and Honolulu. He was then assigned to the Maryland State Department of Health and served as Health Officer of Queen Anne's County, Maryland, for a year. Following this he received special training in cancer problems at Memorial Hospital in New York. He was then assigned to the National Cancer Institute in connection with cancer control work for a period of three years.

During the early part of World War II, he served with the Office of Civilian Defense. For more than three years he was loaned to the United States Army serving in Africa and Europe. He then served in Military Government and Allied Commission medical operations in Sicily, Italy, and later in the Medical Division of the G-5 Division of Supreme Headquarters Allied Expeditionary Force in Northwest Europe. After the surrender of Germany he directed the Health, Welfare, Education, and Religion Division of the Allied Control Council in Berlin.

Military and other decorations awarded him include the United States Typhus Medal for his work in the control of typhus in Northwest Europe during 1944-45; the Legion of Merit (U.S.A.) for outstanding work in controlling communicable diseases in the European Theater of Operations; Croix de Guerre with Palm (France); COMMENDA nell'Ordine dei SS Maurizio e Lazzaro (Italy); and the Order of Public Health (France).

Following detachment from duty with the Army, Doctor Scheele served as Assistant Director of the National Cancer Institute for one year and, prior to his appointment as Surgeon General, was Director of the National Cancer Institute and Associate Director of the National Institute of Health for one year.

Doctor Scheele was appointed Surgeon General for a term of four years, effective April 6, 1948. Among the important Service accomplish-

ments under the direction of Surgeon General Scheele to date (1950) are:

(1) Establishment of the National Heart Institute.

(2) Establishment of the National Institute of Dental Research.

(3) Establishment of a Water Pollution Control Program.

(4) Establishment of the Environmental Health Center, Cincinnati, Ohio.

(5) National Institute of Health became National Institutes of Health in 1948.

(6) Internal reorganization of the Service, providing for more effective organizational machinery and for Divisions of:

Dental Public Health
State Grants
Chronic Disease
Sanitation
Water Pollution Control
Dental Resources
Nursing Resources
Medical and Hospital Resources
Engineering Resources

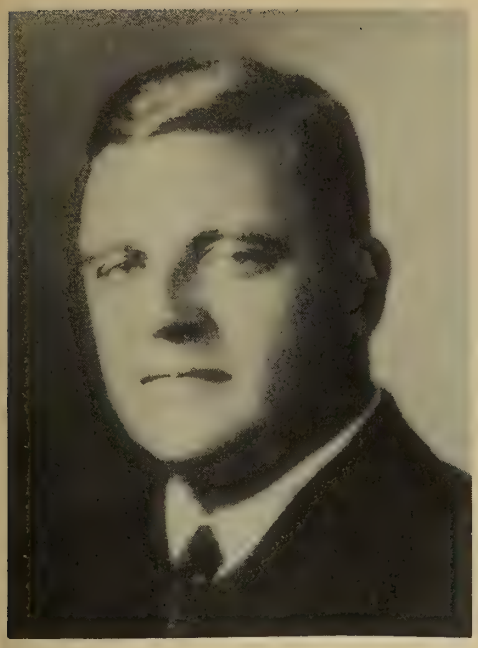
(7) Establishment of the National Institute of Arthritis and Metabolic Diseases.

(8) Establishment of the Institute of Neurological Diseases and Blindness.

A tall man of pleasing and commanding appearance, Doctor Scheele is an affable, able administrator, constantly alert to the objectives to be attained despite increasing diversions and interruptions. He handles difficult problems and situations exceedingly well. Under his leadership public health in the United States should continue to advance.

Administrative Reorganization of Service Headquarters

With the growth of the Service, the creation of four administrative bureaus became necessary. This was accomplished by the Act of November 11, 1943. These Bureaus are the Office of the Surgeon General, then headed by the Assistant to the Surgeon General, the Bureau of State



(From USPHS Records)

Dr. Warren F. Draper, first Deputy Surgeon General.

(From USPHS Records)

Dr. James A. Crabtree, Deputy Surgeon General, September 1, 1946, to May 17, 1948.

(From USPHS Records)

Dr. W. Palmer Dearing, Deputy Surgeon General since 1948.

(From USPHS Records)

Dr. Charles L. Williams, Sr., Chief, Bureau of State Services Since 1947.

(From USPHS Records)

Dr. Ralph C. Williams, first Chief of the Bureau of Medical Services.

(From USPHS Records)

Dr. Carl Michel, first Chief Medical Officer, U. S. Coast Guard, to hold rank of Assistant Surgeon General, 1943-1946.

(From USPHS Records)

Mr. John K. Hoskins,
First Chief Sanitary Engineering Officer, 1943-1948.

(From USPHS Records)

Dr. William Thomas Wright, Jr., first Chief Dental Officer, 1943-1948.

Services, the Bureau of Medical Services, and the National Institute of Health. The position of Deputy Surgeon General was created by the Public Health Service Act of 1944, replacing the position until then known as Assistant to the Surgeon General.

The office of Deputy Surgeon General was filled first by Doctor Warren F. Draper in 1944. He continued in the position during his overseas assignment with the Army, from which he returned in 1945. He served until September 1, 1946, when he relinquished the post for duty with the American Red Cross prior to his retirement in 1947. He was succeeded by Dr. James A. Crabtree, who served from September 1, 1946, until May 17, 1948, being relieved by Dr. W. Palmer Dearing, the present incumbent (1950).

The first Chief of the Bureau of State Services was Dr. Lewis R. Thompson who assumed his duties December 1, 1943. Upon Doctor Thompson's retirement in 1947, Dr. Charles L. Williams, Sr., became Bureau Chief.

When the National Institute of Health was elevated to the status of a Bureau in 1943, Dr. R. Eugene Dyer, who had served as Director of the Institute for a number of years, became Chief of the Bureau. Upon Doctor Dyer's retirement for age in 1950, he was succeeded by Dr. William Henry Sebrell.

Dr. Ralph C. Williams* was appointed Chief of the Bureau of Medical Services on December 1, 1943, and has served continuously in that capacity to date (1950).

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*No family relationship exists between these two Bureau Chiefs, Dr. Charles L. Williams and Dr. Ralph C. Williams, who bear the same surname.

The name Williams has appeared on the official records among the names of career officers of the Service since 1885, when Dr. Louis Laval Williams, a native of South Carolina, entered the Marine Hospital Service. Prior to that time he was engaged in the private practice of medicine in South Carolina. Dr. L. L. Williams had a distinguished career while on active duty in the Service. For a time he served as Chief of the Division of Marine Hospitals. His two sons, Charles L. Williams and Louis L. Williams, Jr., studied medicine. Both of them entered the Regular Corps of the Public Health Service. Thus, the original Williams dynasty consisted of a father and two sons and has continued to expand through the years to include two of Dr. Charles L. Williams' sons, Dr. Charles L. Williams, Jr., and Dr. Stewart M. Williams.

Dr. Ralph C. Williams, a native of Alabama, was the first outlander from the dynasty to enter the Service (1917).

CHAPTER IX

Those Who Carry On

A good name is rather to be chosen than great riches.—PROVERBS, 22:1

Foundation of a Career Service

ONE OF the important problems that confronted Dr. John M. Woodworth, the newly-appointed Supervising Surgeon in 1871, was the development of a mobile corps of carefully selected medical officers to staff the Marine Hospitals and to perform other health functions. The task of formulating regulations concerning the appointment, promotion, discipline, and separation of officers was immediately begun. Under these regulations, procedures were established to determine whether candidates for appointment or promotion were qualified generally, physically, educationally, and professionally. These regulations, effective in 1873, permitted appointments and promotions only after the applicants had successfully passed a comprehensive examination before a board of Service officers. Officers were appointed to general service only and were subject to change of station. The local appointees who had presided independently over the various stations previous to this time were either assimilated into general service or replaced by career officers. As might have been expected, powerful political influences operated to oppose Doctor Woodworth in his accomplishment of this basic personnel policy change. Fortunately, the five Secretaries of the Treasury under whom Doctor Woodworth served during his term of office, 1871-1879, gave their complete support in establishing and maintaining this policy.

The experiences of Doctor Woodworth while a medical officer in the United States Army during the Civil War impressed upon him the effectiveness of a mobile corps of physicians who were required to maintain their physical and professional fitness and who were subject to a definite form of discipline. During his term of office he worked closely

with State and local health authorities in dealing with outbreaks of epidemic diseases. He frequently responded to requests from States and localities by assigning medical officers from the Marine Hospitals to cooperate in handling outbreaks of smallpox, yellow fever, and other epidemic diseases. These experiences emphasized the value of an officer corps sufficiently flexible to enable the directing head to send officers as necessary to meet such sudden exigencies as epidemics, public disasters, or other like emergencies. The events of that era and the accomplishments of the Service in dealing with them laid the foundation upon which was created the commissioned officer corps by the Act of January 4, 1889. This Act established by law the adopted policy of a mobile corps subject to duty anywhere upon assignment, a policy that had been pursued by Doctor Woodworth since he assumed charge of the Bureau of Marine Hospital Service in 1871.

Thus, the first merit system in the Federal Government for the appointment of civilian officers was inaugurated by the Public Health Service on December 1, 1873, when regulations were approved for the government of that Service (then called the Marine Hospital Service). This method was in operation for 10 years prior to the adoption of the United States Civil Service system. It has proved eminently satisfactory as evidenced by the leadership furnished by the Service in the promotion of the public health, and by the contributions to scientific knowledge and progress made by commissioned officers of the Service.

It is evident from the records of the Marine Hospital Service that, in the early days, with each change of administration in national politics there was usually a complete change of medical officers at the Marine Hospitals. The experience of Dr. Benjamin Waterhouse at Boston was an outstanding example of this practice. President Thomas Jefferson appointed Doctor Waterhouse as Surgeon in Charge of the Marine Hospital at Boston. When President Jefferson went out of office, Doctor Waterhouse was replaced by another physician. Doctor Waterhouse felt bitter about his displacement as physician at the Marine Hospital for political reasons, as indicated in the following letter, dated May 8, 1810, to his friend, the English physician, Dr. John C. Lettsom:

> I am ashamed to tell Doctor Jenner how I have been treated by our legislature respecting remuneration. I have received nothing but abuse, nay, more, I have been

intrigued out of my place as Physician to the United States Marine Hospital, with 500 sterling a year, and given me by Mr. Jefferson as a reward for my labors in vaccination, and this merely in consequence of his going out and others coming in, so that, at 56 years of age I have now to contrive and execute some new plan to supply this deficiency.

Need for Career Corps

The establishment of a career corps for the Public Health Service was motivated by the necessity to select competent, well-qualified physicians for duty anywhere in the United States and the world. These medical officers were needed to carry on the work of the hospitals of the Service, to combat epidemics (yellow fever and smallpox were quite prevalent at that time), and to respond quickly to emergency situations that required personnel possessing specialized or broad experience in the medical or public health fields.

The number of career officers in the beginning was small, between 25 and 35 officers. With the expansion of the Service, this number increased gradually. In the first 50 years following the reorganization in 1870, the average number of officers in the career corps was less than 200. As a result, there were many close friendships among officers and their families which fixed firmly a feeling of oneness and of "belonging."

Of the original small group of officers that composed the career corps after the reorganization in the 70's, all had served in the United States Army or in the Confederate Army during the Civil War. Tradition has it that only one of these men had served in the Confederate Army. All the others had been in the United States Army either as medical officers or as soldiers prior to studying medicine. Dr. Robert D. Murray, who later became highly skilled in the diagnosis of yellow fever, was wounded in the face while serving as an enlisted man in the United States Army, losing a part of one eyelid.

Career Corps Broadened to Include Other Than Medical Officers

As the work of the Service expanded and the science of public health developed, it became evident that there was need for the collaboration

of related professions in the public health field. Dentists, sanitary engineers, and pharmacists as professional groups were admitted into the Regular Corps under the authority of an Act of Congress of 1930. (The first woman to be admitted into the Regular Corps was Dr. Estella Ford Warner, a physician commissioned in 1932.)

With further developments in the broad field of hospital service and public health, it has become necessary to still further expand the Regular Corps to include scientists, nurses, dietitians, physical therapists, veterinarians, and sanitarians. The Act of July 1, 1944, provided authority for these appointments. The term scientist is used in the comprehensive sense and includes persons with various types of professional and scientific training. Candidates for appointment as scientists are required to possess the doctorate degree.

In the maintenance of such a corps of career officers, emphasis is placed on the selection of individuals who are well qualified professionally, who meet specified physical requirements, and who have the personal attributes that render them effective in dealing with the public, with other governmental agencies, and with representatives of other nations.

It is important that officers in the various professional categories in the medical and health field—physicians, dentists, sanitary engineers, scientists, pharmacists, nurses, and the like—be selected by members of their own profession for admission into a career corps. This is especially true in an organization such as the Public Health Service, as members of examining boards for any professional classification must be familiar with the many and varied functions of the officers of the Service in that category.

Selection of Officers for Career Corps

Personality appraisal is of unusual importance in a personnel system devoted almost entirely to the selection of health workers who are in direct association with patients, particularly with respect to physicians, dentists, nurses, and physical therapists. Therefore, before the name of an individual is placed on the merit roll indicating that he is eligible for admission into the commissioned corps, he must have been carefully examined physically, professionally, and educationally, and his personal

characteristics must have been found to be satisfactory by a personality evaluation. In general, a well-rounded, adaptable personality is essential to the satisfactory accomplishment of the work of the Service.

A personnel system comprising a commissioned or career corps has the advantage of advancement to the higher grades after a specified length of service based upon a satisfactory performance record and the passing of the required professional and physical examination. Thus, an officer entering the corps may be assured of advancement through the several grades without fear or favor, if he performs his duties in an acceptable manner and if his personal conduct is satisfactory.

There is the decided advantage in the commissioned corps system that as younger men acquire experience in the various disciplines, they may be given special assignments which recognize their particular talents and abilities. It is seldom that a commissioned officer of the Public Health Service who has not had extensive successful experience in the field is given an important assignment at the Washington headquarters. This means that the officers who have supervisory charge in Washington are periodically replaced by officers who have recently had broad field experience. Thus, the central administrative structure of the Public Health Service is kept constantly alert to medical trends, Service problems, and the changing health conditions throughout the United States and the world.

Further advantage in the commissioned corps plan for the Public Health Service is the flexibility of assignment. The work of a far-flung organization such as the Public Health Service requires mobility to meet epidemic and other emergency conditions. Rotation of assignment is an accepted practice in a commissioned corps. Even though an officer receives an unpleasant detail, usually he will be content to serve his turn, knowing that the duty will be completed within a specified time and he will receive another assignment.

The Commissioned Corps in Time of War or National Emergency

As early as 1902, an Act of Congress authorized the President, in time of war or national emergency, to utilize the Service for the pro-

motion of the public interest. In World Wars I and II, the services of commissioned officers of the Public Health Service were drawn on heavily by the Army and Navy, particularly those officers possessing specialized skills. The Public Health Service Act of 1944 provided that in time of war the President could declare the commissioned corps of the Service to be a military service, constituting a branch of the land and naval forces of the United States. This was done by Executive Order No. 9575 of June 21, 1945.

The commissioned corps personnel system provides opportunity to establish and maintain a Reserve Corps of well-qualified individuals essential to aid the Service in meeting emergencies. Emergency public health situations arise with relative frequency. To deal promptly with these problems it is important that an adequate personnel system be maintained whereby physicians, dentists, sanitary engineers, scientists, nurses, and other public health workers may be called to active duty quickly, and within the shortest possible time to be engaged upon the instant task.

The Reserve Corps has proved to be of great value to the Service in meeting emergency and unusual situations, such as the procurement of a large number of officers to meet the heavy burden of providing medical and dental care for veterans of World War I for a period of several years, and later the temporary assignment of officers to the Veterans' Administration. The Reserve Corps has also provided a training ground for officers recently graduated from professional schools and has assisted in the determination of fitness for the Regular Corps. With the coming of World War II, the Reserve Corps was a most valuable means of resolving the many problems then thrust upon the Service, such as furnishing of medical and dental officers for the Coast Guard, the War Shipping Administration, communicable disease control, and the sanitation activities in and around important industrial establishments and military installations.

Development of Commissioned Corps

It is well recognized that pride in an organization is a basic morale factor. A member of a commissioned corps knows that he has been

selected as meeting certain high standards and that he must maintain his fitness. Consequently, he is proud of the organization and will expend unusual efforts to uphold his good name and that of his corps. This fundamental human trait is an important factor in the maintenance of high morale in military and civilian organizations.

The establishment of a career corps whose members were subject to change of station and who were available for duty wherever assigned laid the foundation for the Public Health Service of the present day.

As Surgeon General Woodworth, and later Surgeon General Hamilton, responded to calls for assistance from the cities and States during yellow fever and smallpox epidemics, officers assigned to these duties acquired experience—professional experience in attempting to control and prevent further outbreaks of these diseases, as well as experience in dealing with the public.

From the standpoint of the career officers, there were several unifying forces. In the early days all of them were physicians. They shared common lots in serving in hospitals, at quarantine stations, and in working with epidemics of yellow fever, smallpox, cholera, and other major pestilential diseases. Fellow officers working together under stress, and in time of public concern, contributed largely to the development of a strong "esprit de corps," or pride in the Service, that was so very important in holding together this relatively small group of men who, over a period of many years, constituted the career corps of the Service.

The broadening of the commissioned corps has proved to be of great advantage to the Service, making available many talents and specialized skills in solving health and medical care problems. Public health represents a composite of the sciences. Its roots are in knowledge contributed from the biological, the social, and the physical sciences. Consequently, for its greatest effectiveness in practice, public health involves the concept of the group approach. It is of paramount importance, therefore, that the career corps continue intrinsically as a closely-knit, homogeneous, mobile group; otherwise, the inevitable and dangerous result is a Service of separate groups, isolated, divided, and impotent, thinking and acting in terms of their own special interests.

(From USPHS Records)

First uniform for officers of the Service was designed by Surgeon Trulon V. Miller and used at the Marine Hospital, Chicago, Illinois, 1878. On the lapel of the blouse were the letters "MD" in old English script; the Corps device was used as a cap ornament.

(From USPHS Records)

Seal of the Public Health Service
designed by Surgeon General John M. Woodworth, 1872.

(From USPHS Records)

Overcoat used by Service officers in the late '90's.

LEFT TO RIGHT: *Drs. John McMullen, W. Chester Billings, Mark J. White, Ezra K. Sprague, Victor G. Heiser, Joseph H. White, Charles Styer.*

Structure of the Career Corps

It is to be observed that the career corps was organized along quasi-military lines. Because Dr. John M. Woodworth, the first Surgeon General, and most of the other officers who entered the career corps at the time of the reorganization in 1871, as previously mentioned, had served in either the United States Army or the Confederate Army, it was natural that the military titles in use by medical officers of the armed forces at that time should be adopted for the Service. With minor modification these titles continue in use. Hence, a physician and a dentist who enter the Service in the initial grade are appointed an Assistant Surgeon and an Assistant Dental Surgeon, respectively. The grades of commissioned officers of the Service correspond with grades of officers of the Army. Officers of the Assistant grade correspond to First Lieutenant. The next higher grade, formerly designated as Passed Assistant Surgeon (an old naval term), and changed by the Act of 1944 to Senior Assistant Surgeon, corresponds with that of a Captain in the Army. The next grade is Surgeon, which corresponds to Major; Senior Surgeon, to Lieutenant Colonel; and Medical Director, to Colonel. Titles of other professional groups follow along similar lines such as Assistant Dental Surgeon, Assistant Sanitary Engineer, Senior Assistant Pharmacist, Dental Surgeon, Senior Scientist, and so on. The grade which corresponds to Second Lieutenant was first established by the Act of 1944, for recent graduates in sanitary engineering, nursing, dietetics, pharmacy, and others with a bachelor's degree. Examples of titles of officers of this grade are Junior Assistant Pharmacist or Junior Assistant Dietitian.

The Act of February 28, 1948, authorized two grades for officers having the title of Assistant Surgeon General. An unspecified number of such authorized positions correspond with the grade of Brigadier General or Rear Admiral (Lower half); not more than half of the authorized number may be in the grade of Major General or Rear Admiral (Upper half). The number of Assistant Surgeons General may not exceed three-fourths of one percent of the total number of commissioned officers, Regular and Reserve, on active duty. The Surgeon General has the grade of Major General. Prior to the Act of April 9,

1930, the grade of the Surgeon General was that of Brigadier General. The grade of Deputy Surgeon General corresponds also to that of Major General.

The 1943 Act provided that the four Bureau Chiefs and also the Chief Sanitary Engineering Officer, the Chief Dental Officer, and the Chief Medical Officer of the Coast Guard would have the grade of Assistant Surgeon General with the rank of Brigadier General. John K. Hoskins was the first Chief Sanitary Engineering Officer. Upon the retirement of Mr. Hoskins in 1948, Mark D. Hollis became Chief Sanitary Engineering Officer January 1, 1948. Dr. William T. Wright, Jr., was the first Chief Dental Officer. Doctor Wright was succeeded in 1948 by Dr. Bruce D. Forsyth. Dr. Carl Michel, then serving at Coast Guard Headquarters in Washington, D. C., became the first Chief Medical Officer of the Coast Guard. Based upon the Act of February 28, 1948, the four Bureau Chiefs were raised to the grade of Major General shortly after the approval of that Act.

The objectives of the Service, its accomplishments, and its career personnel policies are well known by, and have received the approbation of, public health workers generally. Even so, the Service makes a point of emphasizing its personnel policies and objectives to every candidate for appointment. It is reasonable then to assume that every individual who is or has been a member of the career corps since 1871 has, with advancing knowledge, exercised his choice to embark upon a career in a mobile service which provides options for work assignments and potentialities for professional advancement limited only by his individual qualifications.

A Close-Knit Organization

For many years the career corps of the Service was spoken of as "a small, close-knit organization," and so it was. The commissioned corps of career officers has made the Public Health Service a functioning organization, for then as now the career corps administered the Service and supervised and participated in virtually all professional and scientific activities. In 1917, the commissioned corps consisted of 187 medical officers on active duty. There were 25 retired officers at that time, mak-

ing a total corps of 212 officers. It was possible in those days for each officer to know practically all his brother officers and their families personally after a few years of service. Although career officers were stationed at outposts in the Pacific and sailed the Bering Sea with the United States Coast Guard, and although hospitals, dispensaries, quarantine stations, and field investigation stations were scattered among a hundred obscure ports and inland towns, it was relatively easy for the Surgeon General and his staff of six Assistant Surgeons General to keep in close touch with the 187 officers on active duty.

Communications between the Washington office and those on duty in the field were frequent and detailed. The personnel files of individual officers for that period show a direct personal contact and individuality that indicated the development and progress of each officer's career. Collectively, these files also show the worth of the corps and a solidarity relatively unaffected by the mill of Government routine and procedure or the shifting tides of politics.

An officer of the Service in those days was "on his own" in a very real sense. Like his Service, an officer before World War I had few masters to serve, few friends to please. Assignments were explicit, relatively simple. Channels of authority were neither devious nor numerous. Relations with the public were limited to contacts with a few special groups and, if questions of authority arose, decisions of an officer could usually be supported by ready reference to the small book of Service Regulations, the book of circular instructions and, on occasion, to the Federal laws. Then, as now, emphasis was placed on performance and personal responsibility for doing a good job. The officer of that time, particularly those on investigative work, enjoyed the advantage of being able to devote his time and energies to his primary task, for he was responsible only to the Surgeon General and one of his principal assistants, and he knew it. He was seldom burdened with conflicting demands and opinions, and never with complicated administrative machinery. He was given an opportunity for accomplishing in his own way and on his own responsibility a task that was satisfying in itself. If he succeeded or if he failed, all the circumstances of his success or failure would be known to his colleagues, and recognition or constructive criticism would be expressed. In such an environment

there developed in the commissioned corps an independence of thought and resourcefulness in action which has proven to be of great value to the Service as a whole. Without the strong individuality of its officers, the Service would probably not have survived the various obstacles and opposition to which it has been subjected through the years.

The "small, close-knit organization" of the commissioned corps of the Service was a group who held certain beliefs about their profession which have fertilized the whole field of organized health work for two generations. Some of their beliefs might appear naive in the light of modern knowledge, some have had to be modified or changed. But these men did not abandon their fundamental faiths and objectives. They believed that scientific investigation at the bench and in the field would yield eventually the knowledge needed to deal with the diseases of man. They believed that preventable diseases could actually be wiped out of this country and that this could be done only through public health organization, that is, through the enforcement of health laws and the operation of public facilities and services for disease prevention by State and local governments. They believed that by these means much suffering and many deaths could be avoided and life expectancy increased by many years. They believed that if shown how prevention of disease worked locally and if made to understand these matters, the people themselves would demand, establish, use, and keep going these public health services. Perhaps the most important belief of this corps of officers was that the destiny of the Public Health Service was in its national health functions, that is, the search for new knowledge, the demonstration of the benefits of new health knowledge to the people through the State and local health departments, and the control of outbreaks of disease. Many of the men who held these beliefs prior to World War I, and their younger disciples who entered the Service before, during, and after World War I, guided the destiny of the Public Health Service through World War II and up to the present day.

Mission of the Career Corps

The mission of the commissioned corps of the Public Health Service as seen by a majority of its officers was conceived as a "mobile group of

skilled specialists" prepared to undertake research whenever required, ready to perform professional and administrative duties, capable of responding to emergency needs and assisting other Federal agencies, as well as State and local officials in the solution of their medical or public health problems.

By the time of World War I, the Public Health Service had won wide recognition as a group of competent specialists in a number of fields. There had been a series of brilliant investigations of such epidemic diseases as yellow fever, bubonic plague, typhoid fever, and cholera. Dr. Joseph Goldberger of the Service, through his work on pellagra, had just demonstrated that a disease affecting enough people to constitute a public health problem need not be communicable.

This was the beginning of a concept later increasingly recognized that there are many problems concerning diseases of public health importance that are not communicable diseases nor related to them. The science of bacteriology had come a long way since its beginning with the work of Pasteur in the 1870's. In fact, rapid developments in these fields had blinded many investigators and public health workers to other matters outside the realm of bacteriology and parisitology. Doctor Goldberger's work in nutrition led the way in emphasizing nutrition as a public health problem. Dr. Joseph W. Schereschewsky of the Service was going with his investigators into factories and mines to learn about industrial hygiene and occupational diseases. The keen, analytical mind of Dr. Wade H. Frost was directing the classic stream pollution studies on the Ohio river and its watershed. Dr. Henry R. Carter and his enthusiastic coworkers were still trying to convince the people of the southern States that malaria was not an instrument of fate but an eradicable disease, and they were getting results.

Sanitary Surveys of Counties

Dr. Leslie L. Lumsden, affectionately known as "Chief" to younger men working with him, a self-styled "shoe-leather epidemiologist," and his co-workers were going from house to house in southern counties preaching the gospel of the sanitary privy. The plan of Lumsden, the rugged realist, was aimed at what is now the goal of public health or-

ganization throughout the United States, namely, the modern, model, all-purpose local health service adequately staffed with well-trained physicians, public health nurses, health educators, sanitarians, technicians, and vital statistics clerks, all housed in a functional, attractive building—the health center serving a community, all of whose citizens can easily reach or be reached by their health service working jointly, even under the same roof, with the local hospitals and private physicians.

To attain this objective, Doctor Lumsden and his fellow workers went into counties where there were no health departments. They went from house to house and told the people that typhoid fever, hookworm disease, and the "summer complaint" which killed their babies all came from their insanitary privies. They showed simply and realistically the difference between a dilapidated backhouse and a fly-proof, ventilated privy. Families were persuaded to rebuild their privies. Later, these health evangelists went back to see whether or not this had been done. They gave lectures on sanitation in homes, school houses, and churches, rounded up the prominent citizens, and gave them the story. By the time the preparatory process was finished, citizens were glad to invite the health workers to survey their towns and counties and tell them what to do. The health men knew what should be done already, but they made the survey and recommendations with the same attention to detail. The purpose?

> The ultimate purpose . . . is to awaken in rural counties an individual and communal interest in public health questions, which will in turn lead to improvement in sanitary conditions and the maintenance of an efficient local health agency.

It has been a truly worthwhile accomplishment in developing from a program of privy building to present day public health work, in 25 years of never-ceasing effort, of unflagging interest. This spirit, as those who worked with Lumsden like to recall, is the thing that gave to all those "builders" (of sanitary privies) the enthusiasm and the zeal of crusaders.

Post-Graduate School of Experience

Such was the graduate school of the Public Health Service at that time for specialists in public health. As previously mentioned, the first School of Public Health in a University was established at Johns Hop-

kins in 1918. Dr. Wade H. Frost of the Service was a member of its first faculty.

Most of the physicians of that era entered the Public Health Service without special postgraduate training except in the school of experience. There they eventually won their "postgraduate degree" by thought and action, won it in the hospitals, in quarantine stations, in workrooms of the Hygienic Laboratory, in cities, small towns, rural counties where an epidemic had broken out, and where somebody had to figure out its cause and how to stop it. Drawing upon the teachings of science and on their own hard-won knowledge, these men from the Public Health Service were more often successful than not. States and cities had learned years before to depend on the doctors from the Marine Hospital Service as men who knew as much about epidemics as was known at that time, who acknowledged they did not know in case they did not, but who spared no effort to find out, who had an intense curiosity about health matters beyond the immediate problem, and who somehow were fertile with ideas to be tried and proven, or discarded.

The concept of the cooperative specialist knowing as much as could be about public health matters and sharing the knowledge and skills with others who needed help proved to be the strength of the Public Health Service. Because it had much to offer and so little to ask in return, the Service has been able to operate as a "free living" organism and to command generally the respect and cooperation of the professions and of State and local health authorities.

Mobility Useful

As noted previously, the Public Health Service placed high value upon mobility soon after the organization of the career corps in 1871. This was due to the need for responding promptly to calls for aid from State and local health authorities in control of outbreaks of epidemic diseases. Rotation of officers in different types of work was found to be useful in broadening the experience and field of knowledge of the individual. Also, serving at different stations on the same type of work was beneficial, such as at hospitals or with different State health departments. Change of environment serves as a useful stimulus to new ideas and increases the ability to meet emergency situations and varied conditions.

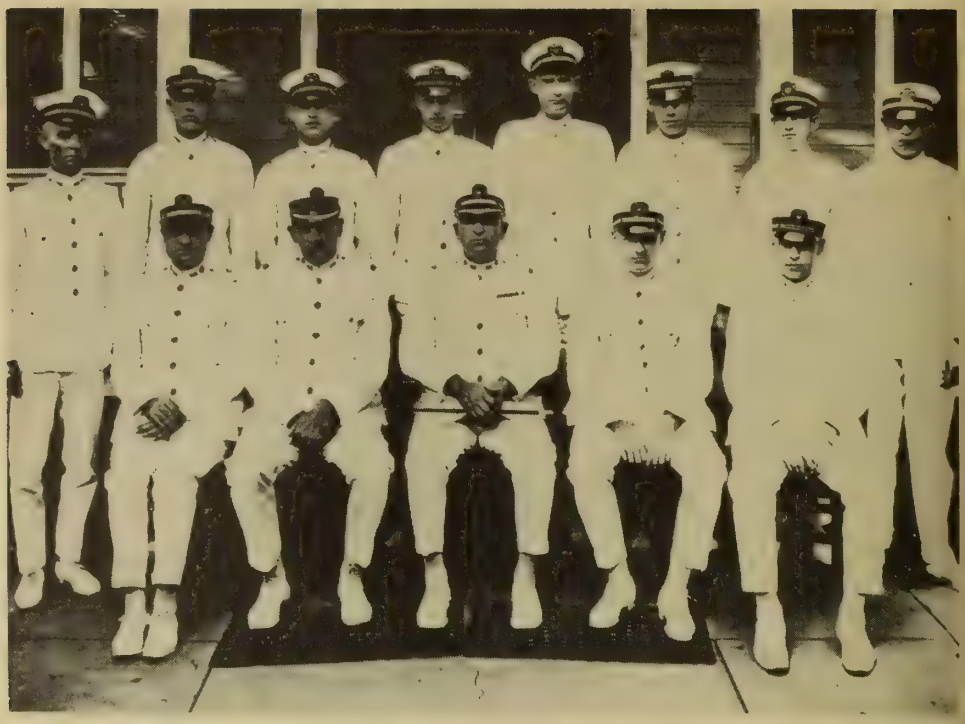
Another factor that emphasized the value of the mobility of the Corps was an "economy of scarcity" under which the Service operated through many years and which compelled the adoption of various administrative expedients. That is to say, the Service operated with too few commissioned officers and too small appropriations to carry out its numerous legal functions efficiently and without sacrifice of both personnel and efficiency. The fact that members of the commissioned corps were subject to transfer and could be detailed anywhere in the world enabled the Service to meet in some fashion most of the demands that were made upon it. The Congress and organizations requesting services learned that new demands would be met. They seldom were aware that the meeting of such demands usually meant the curtailing of some other activity or the abandonment of some worthy project because officers had to be detached from one assignment and flung into the new breach. Of necessity, this practice became common procedure in the administration of the corps. Although all the demands met in this way were for the improvement of the nation's health, sometimes the services rendered had to be spread exceedingly thin.

In the 50 years immediately preceding World War II, numerous laws were enacted by Congress increasing the legal responsibilities of the Service. New powers far beyond the scope of the old Marine Hospital Service were given the Public Health Service. Yet not until the latter part of this period did the Congress expand the commissioned corps to any extent commensurate with its legally imposed duties, nor were appropriations sufficient to operate the growing hospital service as well as other activities such as quarantine, immigration, field investigations, laboratory studies, and assistance to State and local governments. While the Service because of the place of leadership it had won in the field of public health frequently sought new duties which it knew should be undertaken for the good of the nation, much of the legislation was permissive, and the funds available were insufficient. The Surgeon General was legally free to assign officers to various activities or to other Federal agencies, to conduct research, to assist State and local governments, and to carry on various types of field studies subject to the financial limitations. At no time during this period were appropriations or expansion of the career corps forthcoming at a rate proportionate to the needs.

(From USPHS Records)

In the earlier years examining board and candidates were required to report in full-dress uniform at the beginning of an examination. This Examining Board consists of Drs. McIntosh, Pettus, and Cofer; the candidates are appearing to determine their fitness for promotion following passage of the Act of August 14, 1912.

FIRST ROW (Left to right): Drs. William P. McIntosh, William J. Pettus, Leland E. Cofer. SECOND ROW: Drs. John W. Kerr, Mark J. White, Leslie L. Lumsden, Claude H. Lavinder, Rudolph H. von Ezdorf. THIRD ROW: Drs. Milton H. Foster, John McMullen, Lunsford D. Fricks, John F. Anderson.



(From USPHS Records)

The white uniform has been used at hospital and quarantine stations since about 1880. Officers at U. S. Marine Hospital, New Orleans, Louisiana, 1924.

SEATED (Left to right): Drs. Joseph J. Malee, Harry F. White, W. Colby Rucker, Hilaire D. Ogden, Howard M. Walker. STANDING: Pharmacist Frank J. Herty, Drs. George A. Campbell, Eugene C. Stamm, William C. Holmes, Frank L. Van Alstyne, Derrick A. Hoxie, Edwin H. Carnes, Charles H. Frank.

Not until 1930 was the Public Health Service enabled to expand the Regular commissioned corps beyond the number of 212 officers permitted in 1917.

Prior to and after World War I, the promotion of officers in the career corps was distressingly slow. Even the attrition by resignation, retirement, and death did not furnish sufficient vacancies for promotion in a group of younger officers already selected not only for their professional qualifications, but for their physical stamina. Many competent officers encountered the bottleneck of no vacancies in the next higher grade after they had served satisfactorily the required number of years and were otherwise eligible for promotion. A man might be in line of promotion for many years without being promoted because there were no vacancies in the next higher grade.

Many men who were in the Service before and during World War I, and who were then or later recognized as outstanding leaders, were aware that they could never attain a grade higher than surgeon (equivalent to Army grade of major) unless additional legislation were secured.

Important Personnel Legislation

The Act of April 9, 1930, removed the limitations on the number of senior surgeons in the Regular Corps and created the grade of medical director comparable to that of Colonel in the Army. The periods of service required for promotion up to and including the grade of medical director were definitely fixed by this Act. Then, for the first time in the history of the Service, a commissioned officer entering the grade of assistant surgeon could look forward with assurance to promotion through the successive grades up to and including that of medical director, provided his services were satisfactory and he passed the required promotion examinations. An assistant surgeon was eligible for examination for promotion to passed assistant surgeon after three years, to surgeon after 12 years, senior surgeon after 20 years, and to medical director after 26 years of service.

This Act also authorized the commissioning of 55 additional officers and admission to the Regular Corps of dentists, sanitary engineers, and pharmacists. There was also provision that three research scientists

might be commissioned annually in the grades up to and including that of medical director.

Elimination of Unfit Officers

A major objective of the commissioned personnel system of the Service is to acquire and retain capable officers who have acceptable personalities. Obviously, any system of admission cannot avoid the occasional appointment of an inadequate or maladjusted individual. The best interests of all concerned are served by an early correction of the error in a manner least harmful to the person and to the Government. In the interests of good personnel administration, morale, and efficiency, a policy of the Service first set forth in regulations and now embodied in law makes Regular Corps appointments probational in the sense that to be retained the officer shall, when examined for permanent promotion, be found to possess the qualifications required for the higher grade.

This policy as presently set forth in the Public Health Service Act of 1944 is in substance as follows. If for any reason other than physical disability an officer of the Regular Corps is found not to be qualified for promotion, the following action is taken:

For those in the junior assistant grade—separation from the Service.

For those in the assistant grade—separation from the Service and payment of six months' pay and allowance; two examinations are permitted.

In the senior assistant grade—separation from the Service and payment of one year's pay and allowances; two examinations are permitted.

In the full grade—placed in a status "not in line for promotion" and may be retired at such time as the Surgeon General may determine; two examinations are allowed before an officer is placed "not in line for promotion." Exception is made in the case of an officer who fails of promotion to a restricted grade.

Officers entering the Regular Corps through appointment in the senior assistant grade or above must have their records reviewed after the first three years of service and, if found not qualified for further service, they are separated and paid six months' pay and allowances.

Discipline of Commissioned Officers

Service regulations govern the conduct of all commissioned officers, whether on leave, active duty, or retired. Officers detailed for duty with other commissioned services are subject to the laws for the government of the service to which detailed.

Conduct constituting a ground for disciplinary action includes willful disobedience or negligence of lawful orders, excessive use of drugs or intoxicating liquors, malfeasance in office, conviction of a felony or an offense involving moral turpitude, and absence without leave.

When formal charges are preferred against a commissioned officer, he may be ordered to appear before a board of investigation. Such a board consists wholly of commissioned officers of the Service and of not less than three members appointed by the Federal Security Administrator upon recommendation of the Surgeon General. Customarily, the members are of equal or senior rank, and, if practicable, at least one officer is included in the same profession as the accused officer.

An officer ordered to appear before a board of investigation may, if he desires, have counsel to aid in his defense.

Punishment may include reprimand, loss of seniority, reduction of grade, or dismissal from the Service.

Improved Standards of Professional Education

During the period from 1870 until 1905, there were a large number of medical schools in the United States, many of which, lacking adequate educational and training facilities, admitted poorly prepared students. The high tide of medical students in the United States was in 1904. In that year there were 28,142 students registered in the 160 medical schools of this country, and 5,747 were graduated as physicians. The population of the United States then was about 84,000,000. Uniform standards of medical education and licensure were lacking, and a situation had been created obviously detrimental to the best interests of the public and the medical profession.

The problem had engaged the attention of the American Medical Association for some time, and in 1905 it achieved an organization of schools and established minimum standards for medical school accredita-

tion. A program for the maintenance and enforcement of standards appropriate to the time is in continuous operation and has materially raised the standards of medical education. The effects have been salutary. The number of medical schools has diminished from 160 in 1904, to 96 in 1915, to 79 in 1950.

In contrast, the figures for 1950 are of interest. The population is now (1950) estimated at 152,000,000, not quite double that of 1904. In 1950 there are 72 medical schools in the United States giving four years of medical school training. In addition, there are seven medical schools giving only the first two years of the medical course. Students at these two-year schools must transfer and take the last two years of their work elsewhere. Twenty-five thousand one hundred and three medical students were enrolled in the 79 approved medical schools in 1950. There were 5,553 medical graduates for the year 1950.

Standards have gradually been raised through the years until at present (1950) it is accurate to say that a graduate of any approved medical school in the United States can be considered to be professionally competent. Therefore, the necessity for the rigid professional examinations formerly given for entrance into the Service no longer exists. The same reasoning applies to graduates of other professional schools—sanitary engineering, dentistry, pharmacy, and the like.

Economic Conditions Affect Recruitment

Because of economic conditions in the South following the Civil War, many recent graduates in medicine were attracted to the medical services of the Government—Army, Navy, and Marine Hospital Service. Then, too, because of its activity in connection with repeated epidemics of yellow fever in the South, the work of the Marine Hospital Service, and the organization itself, were much better known in the South than elsewhere. As a result, the candidates appearing before boards for examination for entrance into the Service from shortly after its reorganization until recent years were predominantly southern men. Consequently, the commissioned corps of the Service for many years was composed largely of southerners. There was, however, a good admixture of men from the north, midwest, and far west. The Medical School of the University of Virginia enjoyed a high reputation, particularly in its didactic methods. Graduates of "The University" which, to a graduate of the

University of Virginia could mean only one thing, the University of Virginia, constituted an appreciable percentage of the officers of the Corps for a number of years.

The depression of the 1930's brought into the Corps a large number of men from the midwestern schools, many of whom proved to be of outstanding ability. Since then, the geographic distribution in terms of State of origin of the men entering the Corps has been rather wide.

Specialty Boards; Number of Diplomates

Since about the turn of the century there has been a trend toward specialization in the different branches of medicine. Within recent years this tendency toward specialization has been considerably accelerated. Under the national professional organization of the profession concerned there have been developed specialty boards that set up professional standards, conduct examinations, and certify specialists who meet the requirements in the various fields. Each specialty board is separate and autonomous, but in medicine they are all coordinated under a special committee of the American Medical Association. In the field of dentistry, the American Dental Association provides suitable supervision, as does the American Veterinary Medical Association in veterinary medicine, and the American Psychology Association in professional psychology.

In July 1950, out of 889 commissioned officers of the Public Health Service in the medical, dental, scientist (psychologist), and veterinary categories, 206 had been certified by the various specialty boards, as follows:

American Board of Anesthesiology	2
American Board of Dental Public Health	2
American Board of Dermatology and Syphilology	3
American Board of Examiners in Professional Psychology	6
American Board of Internal Medicine	14
American Board of Ophthalmology	3
American Board of Orthopedic Surgery	1
American Board of Otolaryngology	2
American Board of Pathology	12
American Board of Pediatrics	2
American Board of Pedodontics	1
American Board of Preventive Medicine and Public Health	115

American Board of Psychiatry and Neurology	22
American Board of Radiology	6
American Board of Surgery	13
American Board of Urology	1
American Board of Veterinary Public Health	1

Entrance Examinations for the Regular Commissioned Corps

With the approval by the President, in 1873, of regulations governing examinations for the appointment and promotion of officers of the Marine Hospital Service, there was inaugurated a system of officer selection that, broadly speaking, has continued until the present date. The competitive examination developed by Doctor Woodworth and his associates involved certain basic principles of personnel selection that are as sound at the present time as when he inaugurated the system in 1873.

The examination consisted, first, of a physical appraisal of the candidate with reference to the required physical standards of the Service. The examining officers were required to pay special attention to conditions that might impair efficiency or cause early retirement, and only those mentally and physically qualified for active service in any climate were accepted. This examination insured the Service against appointment of the physically deformed, the abnormal, and those with unusual facial or other scars, blemishes, or disfigurements of a handicapping nature in dealing with the public and otherwise in performing the duties of a Service officer. Upon completing the physical examination, each candidate was required to undergo an oral examination, an interview in effect, with the three members of the examining board. In these interviews, which lasted from 20 to 40 minutes, each candidate was given an opportunity, through questioning and discussion, to demonstrate his proficiency in the arts, sciences, history, geography, and current events. In this manner the applicant revealed his ability to think quickly, demonstrated his poise, diction, and other personal traits of interest to an examining board engaged in selecting officers who would not only have professional duties in the care and management of patients, but in addition sanitary and administrative duties in discharging the official responsibilities of the Service.

The written professional test, an essay type of examination, was then given. For a number of years the subjects of this test were seven in number: Anatomy, physiology, chemistry, practice of medicine, practice of surgery, hygiene, and obstetrics. Later two more examinations were added: Materia medica and therapeutics; and pathology and bacteriology. Two subjects were assigned to the applicants for each day devoted to the written examination. The questions, themes, or premises, five for each subject, were quite broad in their scope, as may be expected.

It is of interest to note that, during the nine year period from 1875-1883, of a total of 157 physicians permitted to participate in the entrance examination, 50 were successful, as follows:

Year	*No. examined*	*No. successful*
1875	11	8
1876	13	8
1877	18	6
1878	11	3
1879	29	6
1880	23	4
1881	18	2
1882	15	8
1883	19	5
TOTALS	157	50

As related to the selection of professional personnel, there has been a considerable amount of controversy concerning examinations in general, and essay type of examinations in particular. There is no doubt, however, that the essay type of examination does give the examiners an excellent idea of how the candidate approaches his subject, how accurately and adequately he is able to express what is in his mind. His command of language, precision and facility in writing, and ability to organize his thoughts and present them in logical sequence are demonstrated.

As a part of the professional examination, the candidate was required to examine and report on four hospital patients selected by the examiners. The examinations were usually given at a marine hospital, or at some place where there was easy access to patients undergoing treatment for medical and surgical conditions. This idea of a practical examination was years later applied to dental, sanitary engineer, and pharmacist applicants. From the above it will be seen that the members of the examining board were associated with candidates for a period of approximately 10 days. This period of time, under the circumstances, provided excellent opportunities to appraise each candidate.

Those candidates who were not successful in passing the physical examination were promptly so informed and excused from further participation. As the written examination progressed, if it became obvious to the board that a candidate had fallen too low in his grades, he would be advised to withdraw; if he accepted such advice, he could appear for a later examination without having the record of a failure against him.

Within the recent past, an entirely different type of written professional examinations has been developed. Essentially, it is the short-answer form of examination, and consists of numerous questions and propositions on which the candidate indicates his answers on a selective basis. In some difficult and complex problems, it permits an answer in the form of a specific choice of alternatives.

In this form of examination the answer is objective and certain, rating is easy and inexpensive with the electric scoring machine, the range is wide, and the material susceptible of standardization.

However, it does not take into account those qualities of mind and the discipline of experience which are elicited by free-answer essay type of examination. For instance, it provides no opportunity for a play of the imagination, nor to delve into areas of analysis in assumed situations. Another weakness of the short-answer form is that it gives little evidence of ability to use English, or originality of mind or quality of knowledge, of ability to prepare analyses of complex material, and similar qualities which may be revealed in a free-answer test. For most positions these qualities are all-important.

No system of selecting applicants is without fault. The present system of professional examinations, although not as onerous to the reviewer as that of evaluating numerous essay papers, is still in the trial stage and in process of development.

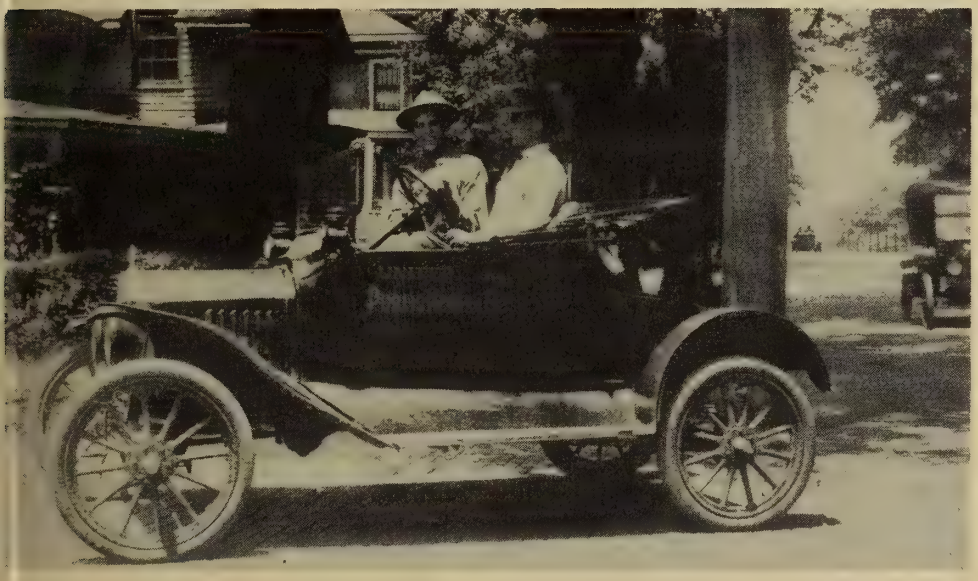
Compensation and Retirement; Regular Commissioned Corps

An Act to promote economy and efficiency in the Marine Hospital Service, approved March 3, 1875, fixed the salary of the Surgeon General at $4,000 per annum. The regulations for the government of the Marine Hospital Service, approved by the President on November 10, 1879, had the effect of fixing the compensation of career officers of the Service at the rates allowed to medical officers of the Army of the same length of service. Traveling expenses and allowances for the transporta-

(Courtesy Dr. Mark V. Ziegler)

"Builders" of the Public Health Service who, at the invitation of the State Health Department, conducted a survey of sanitary conditions in Okmulgee County, Oklahoma, 1917, under the general direction of Dr. Leslie L. Lumsden.

FIRST ROW (Left to right): Drs. Lee B. Matthews, Thomas Parran, William H. Slaughter, Harry R. Crohurst (sanitary engineer), Dr. Mark V. Ziegler. SECOND ROW: Drs. William C. Verdery, Roy P. Sandidge, Ralph C. Williams, Irl B. Krause, John B. Webb.



(Courtesy Dr. Mark V. Ziegler)

Rural sanitation survey, Greenville, South Carolina, 1916. Dr. Joseph D. Applewhite (at wheel) and Dr. Royd R. Sayers.

(From USPHS Records)

Olive-drab uniform, officers on duty at U. S. Marine Hospital, New Orleans, Louisiana, March 1929.

FIRST ROW (Left to right): Drs. James B. Woodruff, Eugene C. Stamm, Donald P. Ross, Leo W. Tucker, W. Colby Rucker, William T. Hollingsworth, Cassius J. Van Slyke, Pendleton J. Slaughter, William A. Padgett. SECOND ROW: Harry F. Fabian (Administrative Officer), Drs. Charles E. Smith, Kenneth R. Nelson, Fritz R. Jackson, James T. Jackson, Walter P. Griffey, Jacques P. Gray, Ivan W. Steele, Russell S. Wolfe, William F. Ossenfort, Raymond L. Evans. THIRD ROW: Drs. Lewis P. Broussard, James W. Bryan, Joseph W. Christie, Herbert G. Brehm, Joseph O. Dean, Guy V. Goodling, Oswald F. Hedley.

tion of baggage and personal effects were also authorized by these regulations.

The regulations approved on May 20, 1889, stated that the compensation of Service officers when not fixed by statute would be fixed by the Secretary of the Treasury at a uniform annual rate for each rank, and specific annual rates were set forth, with provision for pay increases of 10% for each five years' service, not exceeding 40%. The longevity increases and waiting orders (retirement) pay authorized in those regulations were equivalent to those sums then received by medical officers of the Army. Provision in regulations was made effective November 29, 1897, for additional pay for commissioned officers when on duty in a foreign country. The Act of July 1, 1902, specified the salary of the Surgeon General, and provided that the salaries and allowances of commissioned medical officers should be the same as those then provided by regulations of the Marine Hospital Service. This legislation had the effect of legalizing the prior regulations concerning the compensation and allowances, including waiting order status and pay, of commissioned officers. The term "waiting orders" was clarified in a decision of the Comptroller General, under date of October 28, 1922, when he stated that officers of the Public Health Service on permanent waiting orders were in an equivalent status to the retired Army or Navy officer not on active duty. "Waiting orders" was used in lieu of the word retirement from 1889 until the passage of the Public Health Service Act of 1944. This law contains a rather detailed section on the retirement of commissioned officers.

The Act of August 14, 1912, authorized an increase in the pay of officers of the Service making it identical with that of medical officers of the Army of corresponding grades and equivalent service.

The joint service pay Act of May 18, 1920, adjusted the pay of members of the several uniformed services. This was the first occasion on which Public Health Service officers were specifically included in an over-all pay Act together with officer personnel of the Army, Navy, Marine Corps, Coast Guard, and Coast and Geodetic Survey. Increases in pay were granted, and since October 1, 1920, officers of the several services of equal rank and length of service have received the same pay and allowances, including travel allowances for dependents upon permanent change of station. Provision was also included in this Act that thenceforward longevity pay for officers should be based on the total of all service in any or all of the services mentioned.

Since the inclusion of commissioned officers of the Service in the military and naval pay Act, approved May 18, 1920, four other pay Acts affecting officers of the Service have been enacted by the Congress, as follows: (1) An Act to Readjust the Pay and Allowances of the Commissioned and Enlisted Personnel of the Army, Navy, Marine Corps, Coast Guard, Coast and Geodetic Survey, and Public Health Service, approved June 10, 1922; (2) The Pay Readjustment Act, approved June 16, 1942; (3) an Act to provide additional inducements to make a career of the United States Military, Naval and Public Health Service approved August 5, 1947; and (4) the Career Compensation Act of 1949, approved October 12, 1949.

Commissioned Corps of the Public Health Service On Active Duty June 30, 1950

Grades	*Medical*	*Dental*	*Sanitary Engineer*	*Pharmacist*	*Scientist*	*Nurse Officer*	*Dietitian*	*Therapist*	*Veterinarian*	*Sanitarian*
REGULAR CORPS										
Surgeon General	1									
Chief of Bureau	4									
Assistant Surgeon General	8	1	1			1				
Director	173	28	24		12	2				
Senior Grade	164	30	44	7	24	37	4		2	3
Full Grade	110	10	34	8	31	45	5		1	3
Senior Assistant	198	8	9	7	1	82	1			2
Assistant	2		4	2		11				
Junior Assistant			28	4		3	6			
Total	660	77	144	28	68	181	16	0	3	8
RESERVE CORPS										
Director	6		1		1					
Senior Grade	49	6	11	1	1	4	2			7
Full Grade	63	17	25	6	14	19	3	2	6	37
Senior Assistant	104	59	12	8	11	45	12	4	8	38
Assistant	156	57	4	4	1	39	3			12
Junior Assistant			10	3		21	12			63
Total	378	139	63	22	28	128	32	6	14	157
Grand Total	1038	216	207	50	96	309	48	6	17	165

Uniforms of Commissioned Officers

Commissioned officers of the Public Health Service are required to wear the prescribed Service uniforms at stations of the Service and in areas designated by the Surgeon General. With the Civil War recently ended and all of the physicians on duty in the marine hospitals having had military service, it was but a natural step that uniforms be developed for the use of medical officers and other personnel at the marine hospitals. This was particularly logical since most of the patients at these marine hospitals were merchant seamen and officers and enlisted men of the Coast Guard, persons accustomed to discipline and to dealing with uniformed personnel.

Since the 1870's, Service officers have been assigned to the Coast Guard for duty on its vessels and at its stations. Assignment of officers to the Coast Guard, which during peace or war is by law a part of the armed forces, to serve with their uniformed personnel, and the administration of the quarantine function, beginning in 1878, emphasized the need for uniforms for Service officers as representatives of the United States and in official relationships with officers of the United States and foreign flag vessels.

Because the patients treated in the hospitals were, broadly speaking, from maritime or naval sources, and at the quarantine stations the contacts were also maritime or naval, the use of the blue uniform of the early days was appropriate. Dr. Trulon V. Miller, Medical Officer in Charge of the Marine Hospital in Chicago, designed the first Service uniforms, and they were first used at that station in 1878. The first official uniform regulations were issued in 1890.

As the work of the Service expanded into fields removed from the functions of the hospitals and quarantine stations, the need for field uniforms of khaki and olive drab became necessary, particularly in campaigns against epidemic diseases within the United States, such as yellow fever in the early 1880's, bubonic plague in the 1900's, and poliomyelitis in 1916.

As previously noted, since 1902 the President has been authorized to use the Service in times of war or national emergency to such extent and in such manner as would promote the public interest. In World War I,

and again in World War II, the services of Public Health Service personnel having specialized knowledge relating to diseases such as typhus fever, malaria, the venereal diseases, and tropical diseases, were heavily drawn on by the Army and Navy. Selected officers were detailed to and integrated with the armed forces, while retaining their status as officers of the Public Health Service.

During both World Wars, all officers of the Service were required to wear the prescribed uniforms. In World War I, those assigned to marine hospitals, quarantine stations, extra-cantonment duties, and to the Army, wore the khaki or olive drab uniform which varied only slightly from the uniform prescribed for officers of the United States Army. Those detailed to the Coast Guard and the Navy wore the navy type of uniform. In 1930 the Navy or Coast Guard type of blue and white uniforms was adopted for use by officers on assignment where such uniforms were more appropriate than the Army type of uniform. For a number of years a full dress uniform was prescribed for use on occasions of ceremony. A dress uniform was prescribed for use on Sundays, holidays, and certain minor occasions. It will be recalled that the Army utilized blue uniforms until the Spanish-American War in 1898. The khaki uniform was adopted by the Army at that time and later the olive drab uniform was prescribed.

During World War II the uniform regulations of the Service were revised, and two types of uniforms were prescribed. The principal uniforms were those which correspond to the uniforms of commissioned officers of the Coast Guard. In addition, in the case of officers detailed for duty or to serve as liaison officers with other commissioned services, the Surgeon General was authorized to direct the wearing of a uniform corresponding to that prescribed for the commissioned service to which the Service officer was detailed. Insignia distinctive of the Service are worn on each type of uniform, together with appropriate insignia of grade.

The unauthorized wearing of the insignia and uniforms of commissioned officers of the Public Health Service is prohibited by law.

Service Corps Device

The corps device of the Public Health Service which is still in use was designed in 1871 by Surgeon General John M. Woodworth. The cor-

rect symbol of medicine is the knotted wand with one serpent coiled around it, as indicated in accompanying illustrations. This is the caduceus of Aesculapius. The caduceus of Mercury, a winged wand with two serpents entwined, is the symbol of commerce or trade. The caduceus of Mercury, symbolizing commerce, appears on certain French and Belgian coins in use before World War II. The caduceus of Mercury appears in the corps device of the Public Health Service because of its relationship with merchant seamen and the maritime industry. The fouled anchor in the corps device signifies a seaman in distress or a sick seaman. Hence, the corps device of the Public Health Service consisting of a fouled anchor and a caduceus of Mercury, denotes the oldest function of the Service, the operation of Marine Hospitals for the care and treatment of merchant seamen, in its relationship to maritime commerce.

Service Flags

The Public Health Service has two official flags, one for the Surgeon General, the other for use in quarantine work.

The Surgeon General's flag consists of the Service corps device in white upon a blue field. It is flown from the foremast during the Surgeon General's stay on board any quarantine vessel in commission. When the vessel does not have a mast, the flag is flown at the jack staff, taking the place of the quarantine flag.

The quarantine flag is identical in design with the Surgeon General's flag but with the Public Health Service corps device in blue on a yellow field. It is flown at quarantine stations and on a quarantine vessel from the jack staff, except when the vessel has no mast and the presence of the Surgeon General necessitates the use of that staff for his personal flag.

The colors of the Service are blue and yellow, referring to the first two functions imposed by law. The blue connotes the care of merchant seamen, and the yellow the maritime quarantine functions.

Development of the Headquarters Organization

Prior to the reorganization of the Service in 1871, there was no central administrative control of the activities of the various Marine Hospitals,

though it is true that the Service was under the supervision of the Secretary of the Treasury. There was, however, no actual professional leadership, direction, or supervision of the operations of the hospitals from Washington. The various collectors of customs submitted reports annually of the amounts of funds collected and expended by them and they kept in general touch with the affairs of the Marine Hospital Service in their respective ports. These accounts were handled by the "Marine Hospital Service Clerk" in the Treasury Department.

With the appointment of the Supervising Surgeon authorized by the Act of 1870, there came into being the central organization known as the Bureau of the Marine Hospital Service, familiarly spoken of through the years by officers of the Service as "the Bureau" until the creation of four Bureaus within the Service in 1943. In governmental organization, bureau means an entity such as the Weather Bureau, the Bureau of Indian Affairs, or the Bureau of Internal Revenue, under a Department headed by a member of the President's cabinet.

Within the then newly created central organization at Washington, the new directing head, Dr. John M. Woodworth, the Supervising Surgeon, had to develop a staff to handle the administration of marine hospitals. Dr. Preston H. Bailhache, Dr. Frank W. Reilly, and Dr. John B. Hamilton were the officers at the central office with Doctor Woodworth in the early days after the reorganization. The regulations relating to the admission and handling of patients were promptly revised after the reorganization Act of 1870, and were approved on August 3, 1870. Until the enactment of the maritime quarantine Act in 1878, the operating functions of the central office had to do only with the supervision and administration of the Marine Hospitals. With the authorization for the development of the national quarantine system, the establishment of another unit within the Service to handle quarantine matters was a logical step, and there was set up, in addition to the Division of Marine Hospitals and Relief, a Division of Foreign Quarantine. A medical officer was in direct charge of each of these divisions.

As the Service expanded in facilities and personnel, by reason of additional Marine Hospitals and the newly established maritime quarantine stations, personnel and fiscal administration assumed greater import. Hence, there came into being the Division of Personnel and Accounts

having primary functions respecting the appointment, promotion, transfer, discipline, and other matters relating to personnel, as well as budget and fiscal administration.

The quarantine Act of 1878 imposed additional duties and responsibilities upon the Service and upon American consular officers. Responsibility for executing the provisions of the Act was vested in the Surgeon General under the direction of the Secretary of the Treasury. Upon the appearance of infectious or contagious disease in a foreign port or country, the nearest consular officer was required to notify the Surgeon General immediately; like reports of disease prevalence were required respecting vessels from infected ports bound for the United States. In addition, it was the duty of these consular officers to make weekly reports to the Surgeon General of the sanitary condition of the ports where they were stationed. The utilization of the information in a timely and beneficial manner involved added reciprocal dealings with State and local health authorities. Thus, to carry out the functions of the Service under the Act, the Division of Sanitary Reports and Statistics was established.

As relations with the States in health matters increased and developed, there was need to establish an administrative unit that had to do with the prevention of interstate spread of disease and to handle relationships with the State and local health authorities. This branch was designated as the Domestic Quarantine Division and later as the States Relations Division.

The several divisions were organized as needed and functioned as administrative units under the Surgeon General beginning with the Foreign Quarantine Division, about 1878, without specific legal authority. The Act of July 1, 1902, in designating the grade of the chiefs of the administrative divisions of the Bureau, gave particular legal sanction to the establishment of then existing divisions: Division of Marine Hospitals and Relief, Domestic Quarantine Division, Foreign and Insular Quarantine Division, Personnel and Accounts, Sanitary Reports and Statistics, and Scientific Research. This Act also provided that officers in charge of administrative divisions should, while so detailed, hold the grade of Assistant Surgeon General, corresponding at that time to Colonel of the Army.

As the work of the Service increased and expanded, additional divisions were necessary, such as the Division of Venereal Disease and the

Division of Mental Hygiene, each of which was established by a special Act of Congress.

The continued growth of the work of the Service, occasioned by the additional responsibilities imposed from time to time by Acts of Congress, made it necessary to strengthen still further and improve the central administration of the Service. The number of divisions had increased to the point where it was impracticable for the Surgeon General to keep in touch with the work of each. The Act of November 11, 1943, established four bureaus within the Service—the Bureau of State Services, the Bureau of Medical Services, the Office of the Surgeon General, and the National Institute of Health—each to be administered by a Bureau Chief responsible directly to the Surgeon General. Each Bureau Chief is a commissioned officer of the Regular Corps assigned by the Surgeon General. The Act of July 1, 1944, authorized the Surgeon General to assign to the Bureaus the several functions of the Service, and

> . . . to establish within them such divisions, sections, and other units as he may find necessary; and from time to time abolish, transfer, and consolidate divisions, sections, and other units and assign their functions and personnel in such manner as he may find necessary for efficient operation of the Service.

Further, he may delegate to any officer or employee of the Service such of his powers and duties under the Act, except the making of regulations, as he may deem necessary or expedient. No division may be established, abolished, or transferred, and no divisions may be consolidated except with the approval of the Federal Security Administrator.

This broad authorization provides the essentials of organizational flexibility to meet changing conditions in the administration of the Service. In substance, the authority has been in effect since the enactment on November 11, 1943, of Public Law No. 184; the Public Health Service Act of July 1, 1944, superseded Public Law 184.

Locations of the Headquarters Offices

The Headquarters of the Service had its beginning in the Treasury Department Building in 1871 but, because of the inadequate quarters there assigned, it was soon moved to 1421 G Street, N.W., where it occupied a four-story brick building which served as offices, purveying depot, and board rooms for the examination for appointment and promotion of officer candidates and for other personnel purposes. In 1888,

the Headquarters was moved to 1308 F Street, N.W., where it remained until 1891, when it occupied the Butler Building at No. 3 B Street, S.E., at the corner of New Jersey Avenue, on ground now part of the site of the new House Office Building.

As a result of Service expansion, particularly subsequent to 1917, the Headquarters organization, while continuing to occupy the Butler Building, expanded into C Building, a temporary structure at No. 16 Seventh Street, S.W., in July 1920. The Surgeon General maintained offices in both the Butler Building and C Building until April 1929, when the Butler Building was vacated and the Headquarters organization was consolidated in C Building.

In May 1933, the Headquarters organization moved to the Public Health Service Building at 19th Street and Constitution Ave, N.W., where it remained until February 1942 when, because of the war situation, the building was relinquished to the War Department for occupancy by the Joint Allied Chiefs of Staff. As an emergency measure, the Headquarters was located in the old Naval Hospital Buildings at 25th and E Streets, N.W., for the following four months pending the erection of a temporary office building.

The Headquarters was next located in the new temporary office building known as T-6, on the grounds of the National Institutes of Health, Bethesda, Maryland, from May 1942 until January 1946, when Surgeon General Parran and a portion of his staff again occupied the Public Health Service building at 19th Street and Constitution Avenue, N.W. During this period the sanitary engineering activities were located in the Blaine Building at Massachusetts Avenue and 20th Street, N.W. In March 1947, it became necessary to vacate the Public Health Service building on Constitution Avenue for occupancy by the Atomic Energy Commission, and the Headquarters of the Service has been located since that time in the Federal Security Building and the Federal Security Building, South.*

*The Federal Security Building and Federal Security Building, South, were known as the Social Security Board Building and Railroad Retirement Board Building, respectively, prior to December 10, 1947. (FWA Order No. 190, dated December 10, 1947.)

The buildings previously mentioned, which were located at 1421 G Street, Northwest; 3 B Street, Southeast (Butler Building); and 16 Seventh Street, Southwest (C Building), have been demolished.

A major portion of the Headquarters organization remained at Building T-6 until January 1948, when it was consolidated with the other offices of the Service in the two Federal Security Buildings.

Dentists

In 1919 following World War I, dentists were commissioned in the Reserve Corps and assigned to active duty as necessary. The responsibility for providing care and treatment for sick and disabled veterans emphasized the need for dental officers. Prior to that time, dentists had not been utilized by the Service except on a part-time or contract basis.

The first Chief of the Dental Service was Dr. Eugene E. Buell. He was assisted by Dr. Lloyd Y. Beers, who later became Chief Dental Officer of the Veterans' Bureau. Doctor Buell was later transferred to San Francisco and Dr. Clinton T. Messner became Chief of the Dental Service. Doctor Messner furnished leadership for the development of the dental group in the commissioned corps until his death in 1936. Generally, dental schools throughout the country are fairly well represented in the corps. A notable percentage of dental officers have come from the School of Dentistry of the University of Iowa.

The addition of dental officers to hospitals and dispensaries of the Service for clinical care of beneficiaries filled a long felt need. Dental care by competent dentists obviously raised the standard of total health care in Service hospitals. The first dental officer was assigned to a clinic in June 1919.

Soon after the admission of dentists to the corps, dental officers were assigned to duty with the Coast Guard at the Coast Guard Academy, then located at Fort Trumbull, Connecticut, and to cruising Coast Guard cutters, particularly the Bering Sea patrol. Immediately subsequent to the passage of the Act of April 9, 1930, authorizing Regular Corps commissions for dentists, sanitary engineers, and pharmacists, 13 dentists were appointed in the Regular Corps. Currently (1950), there are 77 dental officers on active duty in the Regular Corps. The furnishing of medical care for Federal Prisoners was made a responsibility of the Service in 1930, and shortly thereafter dental officers were assigned to various institutions of the Bureau of Prisons.

Selected dental officers were assigned from time to time to schools of public health for courses of instruction. Several have earned the degree of Master of Public Health. This was useful preparation for the training of qualified dental officers who have guided the public health dental developments on the national level.

Outstanding contributions have been made by Dr. H. Trendley Dean and his associates who, by epidemiological methods, determined the quantitative relation between fluoride in domestic waters and dental health. These studies established both the minimal threshold for dental fluorosis (mottled enamel) and the optimal level for the control of dental caries. Important field studies in the direct application to the teeth of a sodium fluoride solution for the prevention of dental caries have been conducted by Dr. John W. Knutson. Dr. Francis A. Arnold, Jr., was the first to introduce the Syrian hamster as an experimental animal in the study of dental caries. This definitely changed the experimental approach to the study of induced dental caries.

During World War II special recognition was given to the importance of oral health when dental officers were assigned to the various State Health departments. This program was enlarged in 1948 when Congress made funds available for demonstrations of the topical application of sodium fluoride.

The position of Chief Dental Officer for the Service, with the grade of Assistant Surgeon General, was established by Congress through the Act of November 11, 1943. Dr. Bruce D. Forsyth, the present incumbent, is also Associate Chief of the Bureau of Medical Services.

The National Institute of Dental Research, established by Congress through the Act of June 24, 1944, is an important step in the expansion of the dental research program of the Service that has been conducted for a period of several years.

Dietitians

Although the trained dietitian appeared among the Public Health Service personnel for the first time at the comparatively recent date of September 1919, dietary functions were recognized officially from the very beginning. The proper nourishment of hospital patients and staff

members was provided for in the early marine hospitals as indicated by the inclusion in regulations dated March 11, 1800, in the Boston Hospital of a "Diet Table by which the steward is to regulate his issues."

When the marine hospitals were coordinated on a national basis in 1870, the supervising surgeon issued over-all regulations. Food preparation and service remained under the steward. The 1902 Service regulations charged these responsibilities to the pharmacists, the only professional personnel besides the medical officers, attached to the hospitals. A diet table was issued to be observed as a guide in the construction of hospital dietaries, making such modifications as climate, season, the local market, and the proper nourishment of individual patients might indicate.

In the fall of 1919, a dietetic section was organized in the Division of Hospitals with a superintendent of dietitians, Miss Hallie B. Corsette, detailed in Washington. Most of her time was spent in the field developing the various hospital dietary departments and in recruiting dietitians of whom there were approximately 85 at the close of 1919. This number had doubled by 1921.

Dietitians were responsible, under the supervision of the Medical Officer in Charge, for the purchase, preparation, and service of all food. In 1920, according to official reports, "the dietetic program was judged 'a success . . . and resulted in supplying to individual patients a better balanced ration which was better prepared and better served' than previously."

By Executive Order of April 29, 1922, the Public Health Service turned 57 of its hospitals over to the newly established Veterans' Bureau. Over 145 dietitians, including the Headquarters staff, were transferred to the Veterans' Bureau. Dietitians remaining with the Public Health Service in the marine hospitals were placed under the administrative supervision of the Office of Nursing of the Division of Hospitals. Professional supervision was exercised by the medical officer assigned as assistant chief of the division.

Adequate centralized guidance was not provided dietetic activities from that time until 1944, when this service was reinstated at Headquarters. During the interval, the Office of Nursing was responsible for the assignment, promotion, and transfer of dietitians in the field.

(From USPHS Records)

Dr. Clinton T. Messner, who gave leadership during the early development of dental activities.

(Underwood & Underwood, Washington)

Miss Lucy Minnigerode, first Superintendent of Nurses.

As a consequence, dietetic activities at individual stations functioned and developed independently according to the ideas of the individual dietitians and the medical officer in charge at each station. Their organizations, policies, and procedures varied. There was little interchange of ideas except as dietitians transferred from one station to another, or met at conventions and professional meetings. Standardization of quality of service, staffing, and equipment was determined, to a considerable extent, by budgetary considerations. This is not to say that the dietetic service at that time was inadequate or inferior, for indeed, beneficiaries and employees alike agree that the "food in marine hospitals was always good."

In 1944, the Dietetic Section was re-created at Headquarters under the direction of Miss Marjorie J. Wood and with prime responsibility for the development, establishment, and maintenance of dietetic standards in the hospitals of the Public Health Service. Major stress is placed on the therapeutic phases of nutrition and on teaching programs. The first course for dietetic interns was started in 1945 at the Marine Hospital at Staten Island, New York, and was approved by the American Dietetic Association in October of 1946. Twelve interns are accepted each year for the 12-month training program. In July 1947, a nutrition clinic for outpatients was opened at the Public Health Service Dispensary in Washington, D. C. The results warranted establishing a similar facility at the Staten Island Marine Hospital, and plans for extending this service to other stations are being formalized.

Upon Miss Wood's retirement late in 1949, she was succeeded on January 3, 1950, by Miss Marion D. Floyd. The responsibility for the planning, directing, and coordinating of effective and economical dietetic activities continues within the Division of Hospitals. This includes formulation of policies, procedures, and standards for the administration of dietetic services and guidance in the development and direction of programs which will meet the needs of all types of patients in various medical care facilities.

Nurses

Female nurses have been used in Service hospitals since the very early days of the first Marine Hospital in Boston; however, those nurses were

practical nurses and not graduate or professionally trained nurses. Most of the nursing in the Marine Hospitals prior to 1915 was done by men who were former seamen and who, for various reasons, did not care to go back to sea. Occasionally a professionally trained male nurse was employed.

The hospital for the care of arriving aliens at Ellis Island, New York, has been operated by the Public Health Service for the Immigration and Naturalization Service since early in the 1890's. Female nurses were used at the Ellis Island Hospital relatively early. One of the older medical officers recalls that female nurses were on duty at Ellis Island when he was assigned there in 1903. Miss Margaret Daly was the senior nurse. She received her training at Bellevue Hospital in New York. Dr. Charles P. Wertenbaker, an officer of the Service, was an intern at Bellevue in the late 80's while Miss Daly was in training. Miss Daly remained on active duty with the Public Health Service for many years. At Ellis Island there were also professionally trained male nurses, several of whom later became administrative assistants in the Service.

Professionally trained graduate female nurses began to be generally used in marine hospitals beginning about 1912. Public health nurses were used by the Service during World War I in the extra-cantonment sanitation work and in special clinics, such as those for the control and treatment of venereal diseases. There was a rapid expansion of trained nursing service to all hospitals of the Service with the coming of World War I, and particularly to the activities incident to the providing of care and treatment for veterans after the war.

Hospitals for trachoma patients were established in 1913 by Dr. John McMullen soon after the inauguration of the campaign for the eradication of that disease. The first nurse assigned to trachoma duty was sent to Hindman, Kentucky, on August 14, 1913.

Graduate nurses were employed on special field studies from time to time. Miss M. Maude Fauquier was the first nurse assigned to duty with Dr. Joseph Goldberger in 1914 at the hospital for pellagra at Spartanburg, South Carolina. Additional nurses were employed as necessary. Dr. Randolph M. Grimm was in immediate charge of this pellagra hospital (1915-1917).

Following World War I and the placing upon the Service by Congress of the care of sick and disabled veterans, it was necessary that the Public Health Service develop an organized nursing service. Miss Lucy Minnigerode was appointed superintendent of nurses in 1919. It was her responsibility to organize a nursing service for 23 marine hospitals and for the dispensaries and to plan the staffing for additional hospitals which were to total 20,500 beds by April 1922. From 1919 to 1922, the hospital nursing staff grew to a total of 1,800 nurses because of the care furnished veterans of World War I.

The Veterans' Bureau was established in August 1921, and the care of ex-servicemen was transferred to that Bureau. Certain hospitals and personnel of the Service were transferred to that Bureau by Executive Order of April 29, 1922. Included were 1,400 nurses, as well as the physical therapy aides and dietitians who were on duty at the hospitals transferred from the Service.

Following this transfer to the Veterans' Bureau, there remained in the Service a nucleus of 350 nurses, 25 dietitians, and 25 physical therapy aides to serve the nearly 3,000 patients remaining in the 24 hospitals. The hospital nursing service expanded again through the years with the increasing responsibilities of the Public Health Service. Twelve hundred graduate nurses are currently (1950) employed by the Division of Hospitals. These serve in the 24 Service hospitals and clinics. They also serve in Coast Guard training stations, and a few are assigned to foreign quarantine and immigration stations.

In 1930, as previously indicated, the Public Health Service was charged by Congress with the responsibility of providing medical care for the Federal Bureau of Prisons. Nurses have been assigned to several prisons, including the hospital prison at Springfield, Missouri, operated jointly by the Service and the Bureau of Prisons for the Bureau of Prisons.

Nurses especially trained in psychiatric work have been assigned as needed to the hospitals for narcotic addicts at Lexington, Kentucky, and Fort Worth, Texas.

The first public health nurse appointed in the Service was Miss Edna B. Hill for field work in trachoma in 1913.

A survey of the public health nursing needs of the Public Health Service was made in the early 1930's which led to the development of public health nursing in the Service. Miss Pearl McIver, now Chief of the Division of Public Health Nursing, was appointed in 1933 for that purpose.

With the passage of the Social Security Act in 1935, the demand for public health nurse consultants to assist State health departments in developing their expanding public health programs increased greatly as did also the need for the training of personnel. Prior to that time, the Public Health Service furnished very little public health nursing consultant service. A year later, the Public Health Service was asked by the Works Projects Administration to help review and approve those health projects which were operated with Works Project Administration funds. As almost every State health department asked for nursing projects, Miss McIver was assigned to the States Relations Division, then called Domestic Quarantine Division, to assist States in organizing projects of this type and to review projects submitted. This was the beginning of public health nursing consultation service to State health departments.

Since 1936, nursing consultants have been assigned to the various Public Health Service programs as they developed. In 1950 they were participating in the activities of 15 divisions, and two of these divisions, the Division of Public Health Nursing and the Division of Nursing Resources, are administered by nurse officers. Some of the programs to which public health nursing consultants are assigned include industrial hygiene, venereal disease, tuberculosis control, cancer control, communicable disease, and chronic disease.

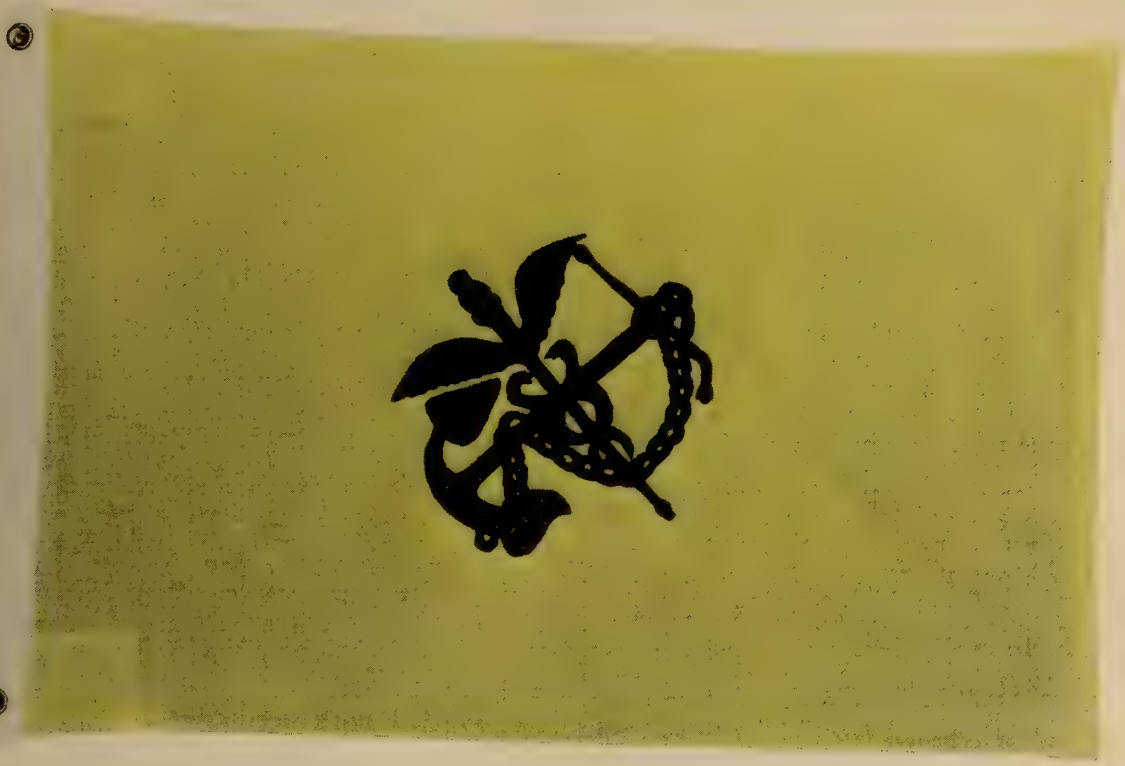
During World War II, the number of public health nurses employed by the Public Health Service increased rapidly. About 200 nurses were recruited for assignment to State health departments for work in war-impact areas. Public Health Service nurses were assigned to work with the Office of Civilian Defense, the Liberian Mission, the United Nations Relief and Rehabilitation Administration, the Migrant Health Program of the Department of Agriculture, and the Office of Inter-American Affairs. Infirmaries in Federal public housing units were staffed by Service nurses. Nurses were assigned to several Coast Guard stations,

(From USPHS Records)

Ship's Quarantine Flag.

(From USPHS Records)

Flag of the Surgeon General, U. S. Public Health Service.



(From USPHS Records)

Public Health Service flag used by boarding launches at Quarantine Stations.

(From USPHS Records)

Service Headquarters, 1891-1929, Butler Building, 3 B Street, S.E., Washington, D. C.

(From USPHS Records)

Service Headquarters, 1933 to 1942, and January 1946 to March 1947, 20th Street and Constitution Avenue, N.W., Washington, D. C.

such as the Coast Guard Academy at New London, Connecticut. They were also assigned to the alien detention stations of the Immigration and Naturalization Service. Nurses have been utilized as quarantine inspectors at the Miami Quarantine Station. They have served in Europe and China in the examination of applicants for immigration visas to the United States. The Act approved July 1, 1944, authorized the appointment of qualified nurses as commissioned officers.

Nursing is also an integral part of the program of the National Institute of Mental Health, the Division of Medical and Hospital Resources, and the Division of International Health. There is a nurse assigned to the Division of Hospital Facilities to assist with architectural plans and equipment. One is now assigned to the Clinical Center at the National Institutes of Health to help with the planning phases of this new Center.

At the present time (1950) there are in the Service 1,200 nurses engaged in clinical activities and 370 nurses in public health and related work.

The appointment of Miss Lucile Petry, the Chief Nurse Officer of the Service, to the grade of Assistant Surgeon General on June 7, 1949, marked merited recognition of the nursing profession by the Service. This is the first time in the history of the United States that a nurse has attained the grade of a general officer (Brigadier General).

Pharmacists

Until the turn of the present century, physicians and pharmacists were the only professionally trained persons employed in the Service hospitals and health activities. Pharmacists have been employed in the Service since its very beginning, under a variety of designations, i.e., apothecary, hospital-steward, pharmacist and chemist, pharmacist, and medical purveyor, each designation comprising one or more grades. Graduation in pharmacy before appointment was first required in 1897.

Whatever his designation, the duties of a Service pharmacist, until 1945, were both administrative and professional. They were the technical administrative officers of the Service, and at hospitals, quarantine stations, and the like, the senior pharmacist served as lay superintendent, receiving general direction from the medical officer in charge to whom

he was responsible. In these duties and assignments pharmacists have performed services of marked importance in the fields of hospital planning and operation; budget, personnel, and supply management; physical maintenance of buildings, ships, and equipment; sanitary inspection, fumigation, rat-proofing of ships; research; and as disbursing and contracting officers. As with all officers of the Service, pharmacists are required to maintain their professional fitness regardless of assignment. Despite their other tasks, their functions have always included significant pharmaceutical responsibilities.

Experience over many years has shown the expediency and effectiveness of having a mobile corps of pharmacists. For the proper performance of their remarkably varied duties, they must have a broad understanding of the methods and functions of the Service, an understanding gained only by training and background of actual participation in field work. Thus, it is the practice to assign pharmacists, upon appointment, to the smaller stations, and later transfer them to more important posts as they become familiar with the Service and as their abilities develop. The availability of the individual pharmacist for whatever duty might be assigned to him and the changes of duty and station have the collective effect of creating a permanent mobile corps of trained pharmacist officers who are essential to effective operation of Service activities.

As the Service expanded through the years, pharmacists have served at most of its field stations, including hospitals, quarantine stations, supply depots, research stations, and the like, both in the United States and abroad; and pharmacists have been detailed for duty at the Headquarters of the Service where one or more such officers have been on duty since 1894, when by law the Surgeon General was authorized to detail "one hospital steward for duty in the Bureau." A number of pharmacists served on yellow fever epidemic duty in charge of fumigation of houses, bedding, and clothing. Frequently they were assigned to inspections and administrative duties during various epidemic campaigns.

As may be expected in a Service primarily concerned with medical care and public health, the function dealing with the procurement and distribution of medical and related supplies is one of importance. The Supply Division, originally known as the Purveying Division and later the Purveying Service, was one of the first organizational segments

established. The officer in charge of the Purveying Division was designated the Medical Purveyor. The Regulations of 1879 required the Medical Purveyor to be a skilled pharmacist and his compensation was the same as that of a surgeon of the Service. This officer also served as a member of the Advisory Board (or Service Board) whose function was to consider matters referred to it relating to Service personnel and the work of the marine hospitals. The first Medical Purveyor was Dr. Oscar Oldberg, a pharmacist. He was appointed as Chief Clerk and Acting Medical Purveyor on July 10, 1877. On September 6, 1879, the office of the Chief Clerk was abolished and Doctor Oldberg was then appointed as Medical Purveyor.

The early regulations of the Service required candidates for appointment as hospital-steward to be "sufficiently . . . skilled in pharmacy and bookkeeping to perform duties of apothecary as well as steward, whenever necessary." The requirement that hospital-stewards be qualified in pharmacy was occasioned by reasons of economy and operating efficiency.

The need for active Service participation and interest in the revision of the Pharmacopoeia of the United States as a public health measure was early recognized, and the Service has been regularly represented at each decennial meeting of the Pharmacopoeial Revision Convention held since the reorganization of the Service in 1871. The 1950-1960 Revision Convention had, in its membership, a Service pharmacist officer, George F. Archambault, as one of the delegates in addition to other Service representatives. This officer has also been elected to membership in the Revision Committee to serve on the five-man Prescription Board of the Pharmacopoeia for the ensuing ten-year period. It is believed that this is the second such recognition of a pharmacist of the Service, Martin I. Wilbert, of the Division of Pharmacology of the Hygienic Laboratory, having served as a Revision Committee member for the U.S.P. IX in 1910.

A betterment of special import to pharmacy resulted from the approval on April 9, 1930, of the "Parker Act" which provided for the coordination of public health activities of the Government. This law included provision for the appointment of pharmacists in the commissioned corps with promotion up to and including the grade corresponding to Army Captain. During the years 1930-1933, 11 pharmacists were

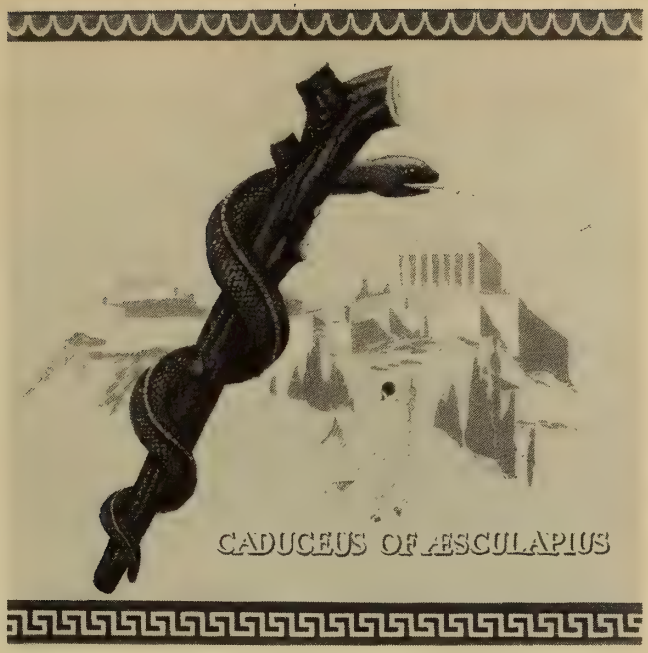
commissioned pursuant to the Act. A further and substantial improvement in the status and opportunity for pharmacists in the Service occurred upon the approval of the Public Health Service Act of 1944 (Public Law 410—78th Congress). Under this Act the promotion limitation was lifted and pharmacists may now be promoted to the Director grade corresponding to that of Army Colonel. Promotions to the Senior and Director grades are made on a selective and competitive basis for a limited and predetermined number of such positions. The first Pharmacist Director of the Service, Mr. Raymond D. Kinsey, was appointed temporarily by promotion in July 1949.

Physical Medicine and Rehabilitation

When Congress in 1919 placed upon the Public Health Service the responsibility for providing medical care for sick and disabled veterans, treatment through the use of such measures as baths, massage, electricity, and manual handicrafts, was employed to a variable extent at the Marine Hospitals of the Service, depending upon the interests, initiative, and ingenuity of the various medical officers. Physical medicine and rehabilitation, as a special field of medical practice at Service hospitals, was then remote because the perennial lack of funds prevented development on other than a casual or fragmentary basis.

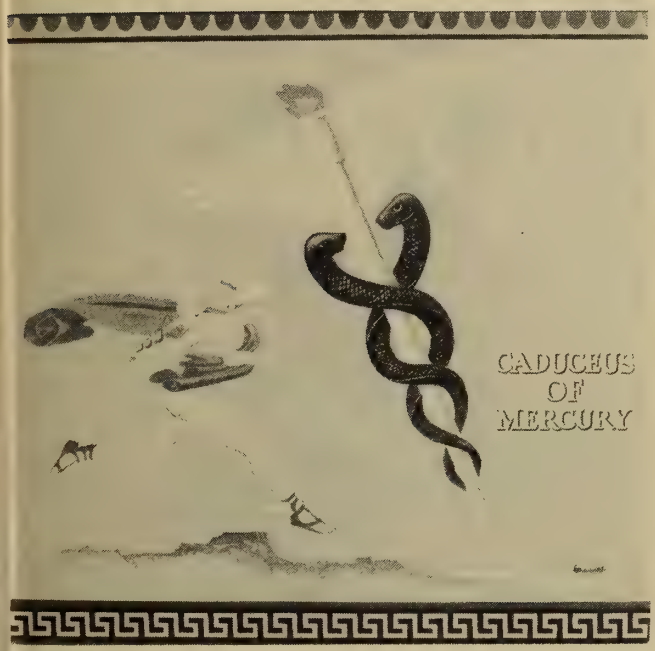
However, in carrying forward the program for the medical care of veterans, among the first organizational units to be created in the expanding Hospital Division was the Reconstruction Service, under the immediate direction of Dr. Robert D. Maddox, Dr. Burt W. Carr, and Miss Isabel Richardson. This service was responsible for the administration and supervision of the application of certain curative measures, other than actual medical and surgical treatment, for patients in the hospitals of the Service. The work embraced all branches of physiotherapy, occupational therapy, which included manual handicrafts and mental work for functional and diversional employment, and the amusements and recreations of the patients and other activities under the direction of the American Red Cross.

At the peak of the direct participation of the Service in the care of disabled veterans, over 600 persons were engaged in reconstruction



(Design by Garnet W. Jex, Public Health Service)

Caduceus of Aesculapius— the correct symbol of medicine.



(Design by Garnet W. Jex, Public Health Service)

Caduceus of Mercury — a symbol of commerce. Its use in the Corps device refers to the original function of the Service of providing medical care for sick and disabled merchant seamen.

(From USPHS Records)

The Service seal (1950)

activities; which included reconstruction officers, special instructors, physiotherapy and occupational therapy aides and assistants. For a time two assistant superintendents (of reconstruction aides) visited the hospitals to appraise and increase the efficiency of the work. The reconstruction officers were usually medical officers who had a special interest in this field of therapy.

After the transfer of the larger part of the hospital organization to the Veterans' Bureau, including the headquarters reconstruction staff, physiotherapy and occupational therapy activities continued in the Marine Hospitals of the Service under the administrative supervision of the Nursing Section (or Office of Nursing, as it was later designated) of the Hospital Division. Professional supervision was exercised by the medical officer assigned as assistant chief of division.

In 1946, Dr. A. William Reggio was assigned to the Division of Hospitals, as Chief of the newly created Physical Medicine and Rehabilitation Section. As an industrial surgeon in Boston, where he had practiced for a number of years prior to World War II, Doctor Reggio had developed a deep interest in physical medicine. Under his guidance a program of physical medicine and rehabilitation began to develop. Doctor Reggio retired from active duty in November 1949.

In 1946, Miss Gertrude Randle, who was on duty at the Marine Hospital at San Francisco, was detailed to the Division of Hospitals in Washington to act as Physical Therapy Supervisor and to assist Doctor Reggio. After approximately one and a half years at Headquarters, Miss Randle requested that she be transferred to duty where she could have contact with patients. Miss Lois Ransom replaced Miss Randle in 1947, and Miss Eleanor Loomis replaced Miss Ransom in November 1949.

Treatments in the physical therapy and occupational therapy departments of the Service hospitals are now given only on a specific modality and purpose prescription basis. Primary emphasis is placed on functional activity which will prevent deconditioning and build up normal function and tolerance by purposeful activity so that the patient can return to work as quickly as possible.

Affiliation training programs for physical therapy and occupational therapy students of accredited physical therapy and occupational thera-

py schools are carried on by several of the Service hospitals and outpatient clinics.

As of June 1950, 61 physical therapists and 15 occupational therapists were on duty in the several hospitals and outpatient clinics of the Service.

Sanitarians

As the responsibilities of the Public Health Service increased and as technical refinements in public health methods were achieved, it became desirable to include a greater variety of technical specialties in the commissioned corps. In order to recruit, hold, and effectively utilize outstanding representatives of the many specialized disciplines whose skills were vital to modern public health work, the Sanitarian category was established in the Reserve Corps in March 1943. The flexibility of this category, plus the valuable contributions of its personnel, soon demonstrated the permanent utility of the device and resulted in the decision, effective April 1948, to make qualified Sanitarians eligible for Regular Corps commissions.

On May 5, 1949, Evelyn Rahm, a health educator, became the first Sanitarian in the Regular Corps. By September 1950, 15 candidates, including bacteriologists, psychiatric social workers, health educators, milk and food specialists, hospital administrative officers, and statisticians, had competed successfully for commissions in the Regular Corps.

Sanitary Engineers

The genesis of sanitary engineering in the Public Health Service came logically with that period during which greatest effort was devoted to studies of water-borne disease, particularly typhoid fever. When medical officers of the Service visited Hamburg, Germany, in 1906, it was noted that slow sand filtration of water resulted in a lowered incidence of cholera. Four years later in Manila, when it was demonstrated that cholera could be reduced by providing safe water supplies and better methods of sewage disposal, and by the elimination of carriers among food handlers, there came the confirmation that the sanitary engineer had a definite place as the environmental therapeutist to supplement the physician in the public health effort.

As early as 1907, Surgeon General Wyman had expressed his need for "a sanitary engineer of high professional standing competent to solve technical problems connected with the purification of water and sewage, the prevention of the pollution of interstate streams, and other matters involving the knowledge of sanitary engineering."*

During the period from 1910 to 1912, investigations were conducted by the Service into the sewage pollution of streams in relation to the spread of typhoid fever. Much of this work was in the Great Lakes drainage basin extending from Duluth, Minnesota, to Ogdensburg, New York. These studies clearly showed the importance of the use of sanitary engineers in problems relating to water supplies, sewage disposal, and industrial wastes.

The first sanitary engineer employed by the Service was Harry P. Letton, placed on duty on June 30, 1913, at the Chicago Public Health Service Laboratory located at the marine hospital. His work was concerned with the quality of the drinking water used on interstate carriers.

As a result of the Act of August 14, 1912, which authorized the Service to conduct field investigations, six sanitary engineers were employed and placed on duty at the Ohio River Investigation Station at Cincinnati, Ohio, now the Environmental Health Center. They were: Ralph E. Tarbett, John K. Hoskins, Harold W. Streeter, Leslie C. Frank, Harry B. Hommon, and Harry R. Crohurst. This nucleus of experienced sanitary engineers was to provide to a large extent the leadership and backbone for the expansion of environmental hygiene activities in the Service during the following three decades.

The work at the Cincinnati laboratory concerned itself with research into the laws of stream pollution and natural purification. In the years that were to follow, scientific information emanated from this station, which is today basic in work of this character. In addition to research work, sanitary surveys were made, and teams, usually consisting of an engineer and a physician, investigated endemic and epidemic typhoid in the States.

During the same period Professor Earle B. Phelps joined the Hygienic Laboratory as Chief of the Division of Chemistry. He also replaced

*Annual Report, The Public Health and Marine Hospital Service, 1907.

Doctor McLaughlin as chief sanitary expert on the International Joint Commission. He conducted much research in sewage disposal and industrial wastes and acted as consultant on other research problems. Professor William T. Sedgwick, of the Massachusetts Institute of Technology, member of the advisory board of the laboratory, and Professor Phelps assisted in the selection of sanitary engineers, bacteriologists, and chemists to work on water and sewage problems.

In 1914, Joseph A. LePrince joined the Service to guide its engineering efforts in malaria control work. Le Prince had previously done outstanding work on yellow fever and malaria control in Cuba and Panama. He later conducted an extensive training program for the young engineers who had joined the Service to handle malaria control in extra-cantonment zones during World War I.

The period from 1913 to 1917 saw gradual expansion in the research activities which were necessary to supply the answers to sanitary engineering problems. As additional engineers joined the Service, more specialization was permitted. The Ohio River studies were expanded to include surveys of watersheds tributary to the Ohio, and Streeter began his studies on water filtration plants, which were to become the basis for the Public Health Service Drinking Water Standards. Industrial waste investigations (cannery, tanning and other) were conducted by Sanitary Engineer Harry B. Hommon.

The concentration of troops and development of war industries during World War I brought about a very sudden expansion of health activities. The States were not adequately equipped to handle the problems incident to this expansion and Federal assistance via a sanitation program in extra-cantonment areas required the abilities of more than 32 Service sanitary engineers. The accomplishments of that period demonstrated to a marked degree that many communicable diseases, particularly typhoid fever and malaria, could be reduced to below pre-war levels even under the adverse conditions caused by crowding and rapid turnover of population.

In 1917 the first sanitary engineer entered the industrial hygiene work of the Service to study environmental problems connected with munitions workers. Studies were made on occupational dusts to aid in the

control of silicosis and tuberculosis. Later studies went into the fields of lead, radium, and benzol poisoning.

The war period and the years that followed saw a significant increase in cooperation with State sanitary engineering staffs where they existed. In those cases where they did not exist, Public Health Service sanitary engineers were lent to the States on a short-time basis to handle the interstate carrier sanitation work, a Federal obligation. This activity resulted in the establishment of sanitary engineering divisions in an increasing number of states. Beginning in 1921 the Interstate Quarantine Regulations were administered on a district area plan under the direction of sanitary engineers. The men who guided these Interstate Sanitary Districts through their infancy included Arthur E. Gorman, Isadore W. Mendelsohn, Andrew F. Allen, Joel E. Connolly, Arthur P. Miller, Arthur L. Dopmeyer, and Edmund C. Sullivan.

A typhoid fever epidemic which occurred in Chicago, New York, and Washington (and to a lesser degree in ten other cities) in December 1924-January 1925, attributed to the distribution of contaminated oysters, resulted in a conference on shellfish pollution in February 1925. A resolution of the confrerees requested the Public Health Service to serve as a clearing house and to coordinate the efforts of the industry and the oyster-producing States to ensure proper sanitation of shellfish-producing areas and of the distributed shellfish. Five Shellfish Sanitation Districts headed by engineers were established. In 1928 the Shellfish Sanitation Districts were merged with the Interstate Sanitary Districts, to be replaced in 1940 by the Public Health Service Districts, and in 1948 to be merged again with the Federal Security Agency Regions.

In 1929 a sanitary engineer was placed in charge of the stream pollution studies, and the Sanitary Engineering Section in the Division of Domestic Quarantine was established.

During the decade which followed World War I, there had been an ever-increasing degree of consulting service rendered to other Federal agencies. This involved the inspection of government buildings and sanitation in the national parks. Later services were rendered to the Bureau of Prisons and the Bureau of Indian Affairs. Assistance to State and local health departments continued as an increasingly important phase in the work of the field staff. The Conference of State Sanitary En-

gineers, established in 1920, has been an important factor in improving Federal-State relationships and in coordinating efforts in the field of environmental health.

Although sanitary engineers had been commissioned in the Reserve Corps of the Service for some time, it was not until 1930 when the Parker Act was passed, that sanitary engineers were authorized to be commissioned in the Regular Corps of the Service. Ralph E. Tarbett and Leslie C. Frank were the first sanitary engineer officers to be commissioned in the Regular Corps on July 23, 1930.

The year 1934 saw an expansion of activities as work began under the Civil Works Administration Act. It consisted of malaria control, community sanitation, typhus fever control, and the sealing of abandoned coal mines. During that year there were only 22 sanitary engineers in the Service.

Between 1938 and 1943 the Corps of Engineers of the Army and the engineers of the Public Health Service conducted a joint stream pollution survey of the Ohio River Basin. It was one of the most complete examinations ever made into the sanitary condition of a major river and its tributaries. Field and laboratory studies were made over an area of 203,000 square miles involving 3,700 municipalities and 1,800 industrial establishments.

During 1940 the sanitary engineering group began an expansion to meet the demands of the second World War. As in the previous war, the concentration of troops and war workers created problems of sanitation. Surveys were made to determine the needs for proposed sanitation projects to be erected under the Lanham Act. Consultant and advisory service was rendered to the Federal Works Agency which appropriated funds in grants or loans to local agencies for 362 water supply projects and 354 sewerage and sewage treatment projects. Engineers and sanitarians had to be trained to meet the needs for duty with the Service, State, and local units. Several mobile laboratories were placed in operation to handle local water, milk, and food sanitation in war areas.

In addition to the wartime expansion within the Service, sanitary engineer officers were on duty with the War Production Board, Office of Civilian Defense, Federal Housing Administration, Federal Public Housing Authority, Pan American Sanitary Bureau, Corps of Engineers,

Air Corps, Sanitary Corps, War Food Administration, Foreign Economic Administration, State Department, Coast Guard, War Manpower Commission, War Shipping Administration, Office of Scientific Research and Development, Department of Agriculture, and the Tennessee Valley Authority. The engineers of the district offices were rendering consultative services to the Bureau of Prisons, Immigration and Naturalization Service, National Park Service, Office of Indian Affairs, Bureau of Reclamation, Forest Service, Bureau of Entomology and Plant Quarantine, Public Buildings Administration, the Alaskan Highway, and the District of Columbia. It was during this period of strain and breakpoint effort that the sanitary engineer most aptly demonstrated his skill to those who guided the nation through it.

The Act of 1943 authorized the grade of Assistant Surgeon General for the Chief Sanitary Engineering Officer of the Service. The Sanitary Engineering Division in the Office of the Surgeon General replaced the Sanitation Section in the States Relations Division.

During 1944, the Vessel Sanitation Section was organized to review all vessel plans and to coordinate the inspection and certification work necessary in connection with water supplies and ratproofing on vessels constructed and operated under the auspices of the Federal Government. During the following year sanitary inspections of existing vessels were begun. The review of plans for newly constructed vessels was continued.

In 1945 the Land and Air Carrier Section was established to expand on the previous regulatory activities in land interstate carrier sanitation. Cooperation with the air transportation industries placed emphasis on sanitation on common carriers in the air.

During 1944-1945 there were 48 sanitary engineers and sanitarians of the Service on duty with the United Nations Relief and Rehabilitation Administration in Europe and Asia. Public Health Service engineers had also been assigned to the Pan American Sanitary Bureau for work in South and Central America.

The Sanitary Engineering Division was transferred to the Bureau of State Services in 1949 and became the Division of Sanitation. The Chief Sanitary Engineering Officer, Mark D. Hollis, became an Associate Chief of that Bureau. As a result of the passage in 1948 of the Water Pollution Control Act, the Division of Water Pollution Control was

established to administer the Service's responsibilities in a nation-wide program for the abatement of stream pollution. The Division of Engineering Resources was established in 1949 to develop new programs and study administrative problems in the expanding environmental health fields. The Radiological Health Branch became a part of this Division and was assigned the job of alerting the nation's public health workers to the dangers of ionizing radiation. In addition to the three divisions mentioned above, the Industrial Hygiene Division, Environmental Health Center, in Cincinnati, Ohio, and the engineering program at the Communicable Disease Center at Atlanta, Georgia, comprise the principal sanitation activities of the Public Health Service.

Scientists

The present group of commissioned officers in the Scientist category had its origin in the Act of July 1, 1902, which provided for the appointment of competent persons to head the divisions of zoology, chemistry, and pharmacology of the Hygienic Laboratory, whenever commissioned medical officers were not available for such duty by detail. These individuals were designated as "Professors," such as Professor of Zoology, and their employment was in accordance with Civil Service requirements. Under the Act of April 9, 1930, two of the incumbents were commissioned in the Regular Corps of the Service.

A Scientist category in the Regular Commissioned Corps was established in 1945, when, after appropriate examination, a number of scientists then having Civil Service status received appointments in the Regular Corps. Since that time examinations have been held regularly for the selection of qualified candidates.

The Scientist officers of the commissioned Corps include a variety of disciplines, such as entomology, bacteriology, biology, parasitology, pharmacology, physics, biostatistics, chemistry, in its numerous branches, and psychology. Candidates for appointments are required to possess the doctorate degree.

These specialists are used extensively in the work of the National Institutes of Health; a number of them are chiefs of laboratories or section heads; and two are assistant directors of Institutes. Many

Scientist officers are also assigned to the Communicable Disease Center at Atlanta, Georgia, where one is deputy director and another is in charge of the Technical Development Laboratory at Savannah, Georgia. The Environmental Health Center at Cincinnati also has Scientist officers on its staff.

Social Service

The first social worker employed by the U. S. Public Health Service was Miss Elizabeth G. Gardiner, who entered on duty July 1, 1921, at the U. S. Marine Hospital, Ellis Island, New York, where immigrant patients and merchant seamen were treated.

A year after her appointment, the staff at the Ellis Island station was increased and on February 1, 1923, a Red Cross worker, who had been assigned to the Hudson Street station several years before was added to the official staff when the Red Cross found it could no longer finance her services.

The first Civil Service examination for social workers for the Public Health Service was announced in 1922, which was prior to the first Classification Act (March 1923). Although persons with training and experience in social work were sought for positions in New York, they were also, at that time, required to be qualified as interpreters in at least two foreign languages. When the second Civil Service examination for social workers in the Service was advertised in 1923 for Boston, the language requirement no longer appeared and requirements for education and experience in social case work were rigidly specified, but many social service vacancies were later filled by "Special Nurses."

Supervision of social service activities at first was placed under the Headquarters nursing staff, and later for a short time under the section on rehabilitation.

Meanwhile, social workers were assigned to Service hospitals, but their salaries were often paid by other organizations. War Shipping Administration social workers, employed in principal ports from 1942 to 1945, gave much of their time to patients in Marine Hospitals and clinics. When this program was discontinued, strenuous efforts were made by the hospitals to retain the services of the social workers. The American Red Cross financed the program for a short period until

budgetary provision could be made by the Service for adding many of these social workers to the regular clinic and hospital staffs.

Since July 1949, when the Red Cross withdrew its staff from the U. S. Public Health Service Hospital, Fort Worth, Texas, all social workers at Public Health Service stations have been paid by the Service.

From the early beginnings of providing recreation, distributing cigarettes, and operating canteens, social service has emerged as a professional service. By September 1950, nine hospitals and four outpatient clinics were staffed by 22 qualified medical and psychiatric social workers who brought to the medical team an understanding of the patient's background and social situation, who helped patients and their families understand and accept their medical limitations, and assisted in making post-discharge plans which would carry out medical recommendations after hospital or clinic care had been terminated. In spite of staff shortages necessitated by budgetary considerations, two Service stations, one hospital and one outpatient clinic, were approved by graduate schools of social work for student training while two others were preparing for such programs.

A qualified social service staff was first assigned to Service Headquarters in 1945, when Miss Eleanor Criger assumed office as medical social consultant to the Division of Tuberculosis. This Division's staff was increased to seven Headquarters social workers by 1950, who offer consultation and demonstration services to States, local health departments, hospitals and communities and engaged in social studies and research. In October 1946 Mr. Daniel E. O'Keefe became the first psychiatric social work consultant to the Mental Hygiene Division, which later became the National Institute of Mental Health. Mr. O'Keefe was the first social worker to be commissioned in the regular corps (sanitarian). By 1950, the staff at Headquarters was increased to three psychiatric social workers, while four psychiatric social work consultants were assigned to regional offices for assistance to States in the mental health program, and four psychiatric social workers were assigned to two demonstration mental health clinics. Consultation is available to State mental health authorities, stipends to students of psychiatric social work are granted, research projects are approved, and the psychiatric social work curricula of schools of social work are being strengthened.

In November 1948, Mrs. Cynthia R. Nathan, a medical and psychiatric social worker, was appointed in the Division of Hospitals at Headquarters to develop a program in this field for the hospitals and outpatient clinics of the Service.

The year 1949 saw the addition of a medical social consultant, Mrs. Geneva Feamon Lundberg, to the Headquarters staff of the Division of Chronic Disease, and the following year additional staff was secured to develop a home care project for patients with chronic illnesses so that hospital beds might be used by acutely ill patients.

Veterinarians

The earliest reference to veterinary medicine in the Public Health Service is found in a book by Dr. Frank Billings of Chicago, Illinois, written on the activities of veterinary medicine in the latter half of the nineteenth century.* In this book Doctor Billings points out the necessity for a Federal veterinary service either in the Department of Agriculture or in the Public Health Service. When the National Board of Health was established in 1879, for its short-lived period of four years, Doctor Billings was very active in suggesting the establishment of a veterinary bureau or division in this agency. A Bureau of Animal Industry was finally established in the office of the Agriculture Commissioner in 1884, due to the introduction of contagious pleuropneumonia in the United States which was causing serious losses to the economic interests of the country.

In 1936, Dr. Maurice C. Hall was brought to the National Institute of Health as Chief of the Division of Zoology. At the same time, Dr. Willard H. Wright, who is now Chief, Laboratory of Tropical Diseases, entered the National Institute of Health. While both of these individuals had degrees in veterinary medicine, their primary training was in the field of medical parasitology, and their interest in veterinary medicine was incidental.

Between 1924 and 1929, Drs. Clarence E. Smith, William H. Haskell, Rex D. Bushong, and Franklin Clark, veterinarians, joined the Public Health Service as milk specialists. They did much of the pioneer work

**The Relation of Animal Diseases to the Public Health, and Their Prevention.*

in developing the U. S. Public Health Service milk ordinance program under Leslie C. Frank, a sanitary engineer.

In 1941 Drs. Raymond Helvig, Edmund R. Price, and Frank W. Failing were brought into the Public Health Service as milk and food specialists to assist in the wartime expansion of milk and food sanitation work. These men worked under the direction of Dr. William H. Haskell before they were assigned to Regional offices. Doctors Helvig and Price were commissioned in 1943 as sanitarians and continued in that category until they were transferred to the veterinarian category of the commissioned corps in the fall of 1947.

Dr. James H. Steele, Veterinary Director, Communicable Disease Center, Atlanta, Georgia, entered the Public Health Service in November, 1943, as a sanitarian and was assigned to Puerto Rico. On termination of World War II, he was ordered back to Washington to draft a program that would encompass the control of animal diseases communicable to man and of public health significance. In 1947, the veterinarian category was established in the Regular Corps of the Public Health Service. The first appointments in this category were made in September 1947. In February 1948, Doctor Steele was appointed to the Regular Corps as the first veterinary officer. Veterinary personnel of the Service at present (October 1950) totals 33.

VETERINARY PUBLIC HEALTH PROGRAM

At the Communicable Disease Center, field investigations, demonstrations, State aid, interstate quarantine enforcement as it relates to animal diseases and their spread to persons, training concerned with all aspects of the control of animal diseases transmissible to man, and laboratory and technical development studies are the functions of the veterinary public health program. The animal diseases receiving most attention are rabies, brucellosis, salmonellosis, creeping eruption, Q fever, histoplasmosis, beef tapeworms, and the encephalitides. Rabies and brucellosis are considered the major problems. Fifteen States have received direct aid in establishing veterinary public health programs.

Veterinary participation in the medical research of the National Institutes of Health program includes infectious diseases, cancer, comparative pathology, and the large scale production of experimental

(From USPHS Records)

Nurse officers' uniform, U. S. Marine Hospital, Baltimore, Maryland, summer 1948.

FIRST ROW (Left to right): Gladys C. Guydes, Jennie Martell, Chief Nurse (dress-white uniform); Ruth M. Buzalski. SECOND ROW: Carolyn E. Cullen, Rose L. Martin, Lorraine G. Grush, Martha G. Laestar.

(From USPHS Records)

The blue uniform is worn (1950) by officers on duty in hospitals and at quarantine stations of the Service, as well as by officers assigned to the Coast Guard and the Bureau of Prisons. Less frequently used is the olive-drab uniform which may be worn on other types of field duty when authorized.

(From USPHS Records)

Officers' cap device, in use for approximately 50 years.

animals. The studies of infectious diseases have included brucellosis, Q fever, and encephalitis. The comparative pathology and hematology section, under the direction of Dr. William T. S. Thorp, Senior Veterinarian, provides diagnostic and histopathologic services on various research problems including the encephalitides, brucellosis, histoplasmosis, and tropical diseases. This section also supervises the study of spontaneous diseases of laboratory animals, a project very important to research because of the confusion which has occurred in the past in reporting spontaneous infection as a disease resulting from the challenge inoculum. Cancer research provides many opportunities in comparative medicine investigations, especially the transmissible malignancies of domestic birds and animals in addition to the spontaneous tumors of all lower animals. An important study is the pathology of transplanted bone tumors and the effect of isotopes to induce malignant tumors in experimental animals.

Veterinary officers participate in milk and food hygiene, radiological health, and industrial hygiene investigations. Milk and food hygiene are among the oldest activities of veterinary public health.

Radiological health developments require the services of veterinary officers in field investigations and training. The effects of radioactive substances are being followed in animal and animal products and their secondary effects.

Diseases Acquired by Personnel of the Public Health Service in Performance of Duty

A number of officers and employees while in the performance of their work have contracted diseases and made complete recoveries. Almost all of the medical officers who served at quarantine stations in the southern States during the yellow fever era, except those immune to the disease, contracted yellow fever. Among these officers were Dr. Henry R. Carter, Dr. Julius O. Cobb, Dr. Taliaferro Clark, Dr. Eugene Wasdin, Dr. Lunsford D. Fricks, Dr. Thomas B. Berry, Dr. W. Colby Rucker, Dr. Rudolph H. von Ezdorf, Dr. Joseph Goldberger, Dr. Thomas F. Richardson, Dr. Herman B. Parker, Dr. Marshall C. Guthrie, Dr. Francis H. McKeon, Dr. John F. Anderson, and Pharmacist Benjamin E. Holsendorf.

During the pandemic of influenza in 1918, a large number of Service personnel, medical officers, nurses, and others, became ill from influenza, yet only three lost their lives. In dealing with diseases like tularemia, psittacosis, and Q fever, many investigators have acquired the infection. Completely accurate figures on such acquired infections are difficult of final verification; however, so far as can be determined by existing records, the data listed below give the number of cases of infection acquired in line of duty and the deaths resulting therefrom:

Known Infections Contracted by Service Personnel in the Course of Research and Control Activities Up to January 1951

Disease	*No. of Cases*	*No. of Deaths*
Amebic Dysentery	6	.....
Brucellosis (Undulant Fever)	11	.....
Choriomeningitis	8	.....
Encephalitis (Venezuelan)	1	.....
Plague	1	.....
Meningococcus Meningitis	2	2
Psittacosis (Parrot Fever)	11	1
Q Fever	79	1
Relapsing Fever	8	.....
Rickettsial Pox	1	.....
Rocky Mountain Spotted Fever	33	4
Smallpox	12	1
Tsutsugamushi (Scrub Typhus)	7	2
Tuberculosis	3	1
Tularemia (Rabbit Fever)	33	2
Typhoid Fever	7	2
Typhus Fever	27	.....
Yellow Fever	21	8
TOTAL	271	24

Roll of Honor

Any organization which has for its principal object the conduct of a relentless war against disease must suffer casualties in the conflict. Since the reorganization of the Public Health Service in 1871, 55 persons are known to have died in the performance of duty, from disease contracted

while engaged in their official duties, or war casualties, or in connection with accidents or other circumstances directly concerned with their employment.

It requires courage and determination of a high order to meet an unseen and little known foe in an epidemic, in the laboratory, or in studies in the field. Thus, the Roll of Honor of the Public Health Service workers occupies a place parallel to the lists of those who gave their lives in other national defense causes. Although every effort has been made to present a complete roster of those deceased Public Health Service officers and employees whose deaths resulted from incidents of their service, it is possible that this list may not be complete.

Name	*Cause of Death*	*Year and Place*
1. ASSISTANT SURGEON Roswell H. Waldo	Yellow Fever	1878—Cairo, Ill.
2. ASSISTANT SURGEON William C. W. Glazier	Yellow Fever	1880—Key West, Fla.
3. HOSPITAL STEWARD John M. Green	Yellow Fever	1881—Key West, Fla.
4. ASSISTANT SURGEON William R. McAdam	Yellow Fever	1889—Key West, Fla.
5. ASSISTANT SURGEON John F. Groenvelt	Yellow Fever	1891—Chandeleur Island, Miss.
6. ASSISTANT SURGEON John W. Branham	Yellow Fever	1893—Brunswick, Ga.
7. PASSED ASSISTANT SURGEON Spencer C. Devan	Tuberculosis	1893—Delaware Breakwater Quarantine
8. PASSED ASSISTANT SURGEON William D. Bratton	Fall, quarantine vessel	1897—Sabine Pass, Texas
9. ASSISTANT SURGEON Emil Prochazka	Tuberculosis	1898—Delaware Breakwater Quarantine
10. ASSISTANT SURGEON Charles E. Decker	Tuberculosis	1903—San Diego, Calif.
11. SURGEON Robert D. Murray	Accident during yellow fever outbreak	1903—Laredo, Texas

Name	*Cause of Death*	*Year and Place*
12. PASSED ASSISTANT SURGEON		
Thomas F. Richardson	Typhoid Fever	1906—New Orleans, La.
13. ASSISTANT SURGEON		
William W. Miller	Typhoid Fever	1908—Washington, D. C.
14. PASSED ASSISTANT SURGEON		
William M. Wightman	Yellow Fever	1909—Guayaquil, Ecuador
15. PASSED ASSISTANT SURGEON		
Thomas B. McClintic	Rocky Mt. Spotted Fever	1912—En route from Hamilton, Montana, to Washington, D. C.
16. ATTENDANT		
Clifford G. Hedgepeth	Injury, quarantine vessel	1913—Fort Monroe, Va.
17. ASSISTANT SURGEON		
Luther W. Jenkins	Drowned	1914—Coast Guard Cutter *Manning*, Aleutian, Islands
18. SCIENTIFIC ASSISTANT		
Playford L. Rush	Influenza	1918—Engleside, N. J.
19. SURGEON		
Donald H. Currie	Influenza	1918—Boston, Mass.
20. FUMIGATOR		
M. Jett	Fall, fumigation duty	1919—New Orleans, La.
21. FUMIGATOR		
Peter W. Segari	Hydrocyanic gas, fumigation duty	1919—New Orleans, La.
22. ASSISTANT SURGEON		
Hugh D. Ward	Influenza	1919—Spartanburg, S. C.
23. ACTING ASSISTANT SURGEON		
William J. S. Stewart	Yellow Fever	1919—Caracas, Venezuela
24. LABORATORY ASSISTANT		
William E. Gittinger	Rocky Mt. Spotted Fever	1922—Hamilton, Mont.
25. CHIEF FUMIGATOR		
Frank Gilbert	Hydrocyanic gas, fumigation duty	1922—San Francisco, Calif.
26. ASSISTANT FUMIGATOR		
Theodore Rasmussen	Hydrocyanic gas, fumigation duty	1922—San Francisco, Calif.

Name	*Cause of Death*	*Year and Place*
27. ASSISTANT FUMIGATOR		
Albert E. Fox	Hydrocyanic gas, fumigation duty	1922—San Francisco, Calif.
28. NURSE		
Edith M. Hartzel	Meningitis	1923—Ellis Island, N. Y.
29. LABORATORY ASSISTANT		
George H. Cowan	Rocky Mt. Spotted Fever	1924—Hamilton, Mont.
30. ATTENDANT		
Frank A. Mace	Smallpox	1926—San Francisco, Calif.
31. BACTERIOLOGIST		
Leroy A. Kerlee	Rocky Mt. Spotted Fever	1928—Hamilton, Mont.
32. TECHNICIAN		
William Lindgren	Tuberculosis	1928—Washington, D. C.
33. LABORATORY ATTENDANT		
Harry B. Anderson	Psittacosis	1930—Washington, D. C.
34. LABORATORY ATTENDANT		
Martin L. Nolan	Tularemia	1931—Hamilton, Mont.
35. MARINE ENGINEER		
James N. Lee	Explosion aboard station launch	1931—Fort Monroe, Va.
36. JUNIOR BACTERIOLOGIST		
Anna M. Pabst	Meningitis	1935—Washington, D. C.
37. ACTING ASSISTANT SURGEON		
Lester G. Miller	Fall, quarantine vessel	1936—New Orleans, La.
38. CARETAKER		
Asa D. Marcey	Q Fever	1940—Washington, D. C.
39. FUMIGATOR		
Edmund R. Seruntine	Asphyxiation	1940—New Orleans, La.
40. FUMIGATOR		
James J. Collins	Drowned	1940—New Orleans, La.
41. ASSISTANT SANITARY ENGINEER		
William H. Payne	Explosion at ordnance plant	1942—LaPorte, Ind.
42. PASSED ASST. SAN. ENGINEER		
Robert W. Kehr	Airplane Crash	1942—Vancouver, B. C.

Name	*Cause of Death*	*Year and Place*
43. PASSED ASSISTANT SURGEON Haskell D. Rosenblum	Enemy Action, World War II	1942—Aboard Coast Guard Cutter *Muskeget,* North Atlantic
44. PASSED ASSISTANT SURGEON Ralph R. Nix	Enemy Action, World War II	1943—Aboard Coast Guard Cutter *Escanaba*
45. ASSISTANT SURGEON Theodore L. Chamberlin	Airplane Crash	1943—Iceland (on duty with Coast Guard)
46. ADMINISTRATIVE ASSISTANT August L. Cavitt	Explosion aboard quarantine tug	1943—New Orleans, La.
47. PASSED ASSISTANT SURGEON Richard G. Henderson	Scrub Typhus	1944—Bethesda, Md.
48. SCIENTIFIC AIDE Philip L. Jones	Scrub Typhus	1944—Hamilton, Mont.
49. LABORATORY ASSISTANT Rose Parrott	Tularemia	1944—Baltimore, Md.
50. SURGEON Fred J. Black	Prisoner of War by Japanese, World War II	1944—Off coast of Formosa
51. SURGEON Floyd A. Hawk	Prisoner of War by Japanese, World War II	1945—Fukuoka, Japan
52. ASSISTANT SURGEON (R) Leon Glassman	Enemy Action, World War II	1945—Aboard hospital ship *U.S.S. Samaritan,* Pacific Area
53. ASSISTANT NURSE OFFICER (R) Catherine McCarthy	Airplane Crash	1945—En route, Naples, Italy
54. PASSED ASSISTANT SURGEON (R) Harry M. Levin	Enemy Action, World War II	1945—Aboard *U.S.S. Serpens*
55. PASSED ASSISTANT SURGEON (R) Pasquale P. Coviello	Airplane Crash	1946—Westover, Mass.

Compensation for Beneficiaries of Service Personnel

As early as 1898 a precedent was set by Congress when two years' pay and allowances were provided for the legal beneficiaries of Dr. John W. Branham, who died in Brunswick, Georgia, in 1893 from yellow fever contracted in line of duty. Similar enactments, some authorizing monthly annuities, benefited the dependents of Drs. William W. Wightman, Thomas B. McClintic, Rudolph H. von Ezdorf, Joseph Goldberger, and Melvin W. Glover.

These authorizations gave recognition to the service-connected nature of the diseases and injuries which resulted in the deaths of these officers.

The Federal Employees' Compensation Act of 1916, as amended, provides compensation, including medical care as specified in the Act, for the disability or death of an employee resulting from a personal injury sustained while in the performance of his duty. Commissioned officers of the Public Health Service, both Regular and Reserve, including their surviving beneficiaries, were first provided for and given entitlement to benefits under the Federal Employees' Compensation law by the Public Health Service Act of 1943. This Act was repealed by the Public Health Service Act of July 1, 1944, which, in turn, provided that commissioned officers of the Regular Corps of the Public Health Service and officers in the Reserve on active duty were included within the definition of "employee" in the Federal Compensation Act. Under the Federal Employees' Compensation Act, as amended to October 14, 1949, the widow or widower and other dependents of the officer are eligible for compensation not to exceed $525 per month if the death of the officer resulted from a personal injury in the performance of his duty. A disease proximately related to the employee's duties is considered the same as an injury for the purposes of this Act.

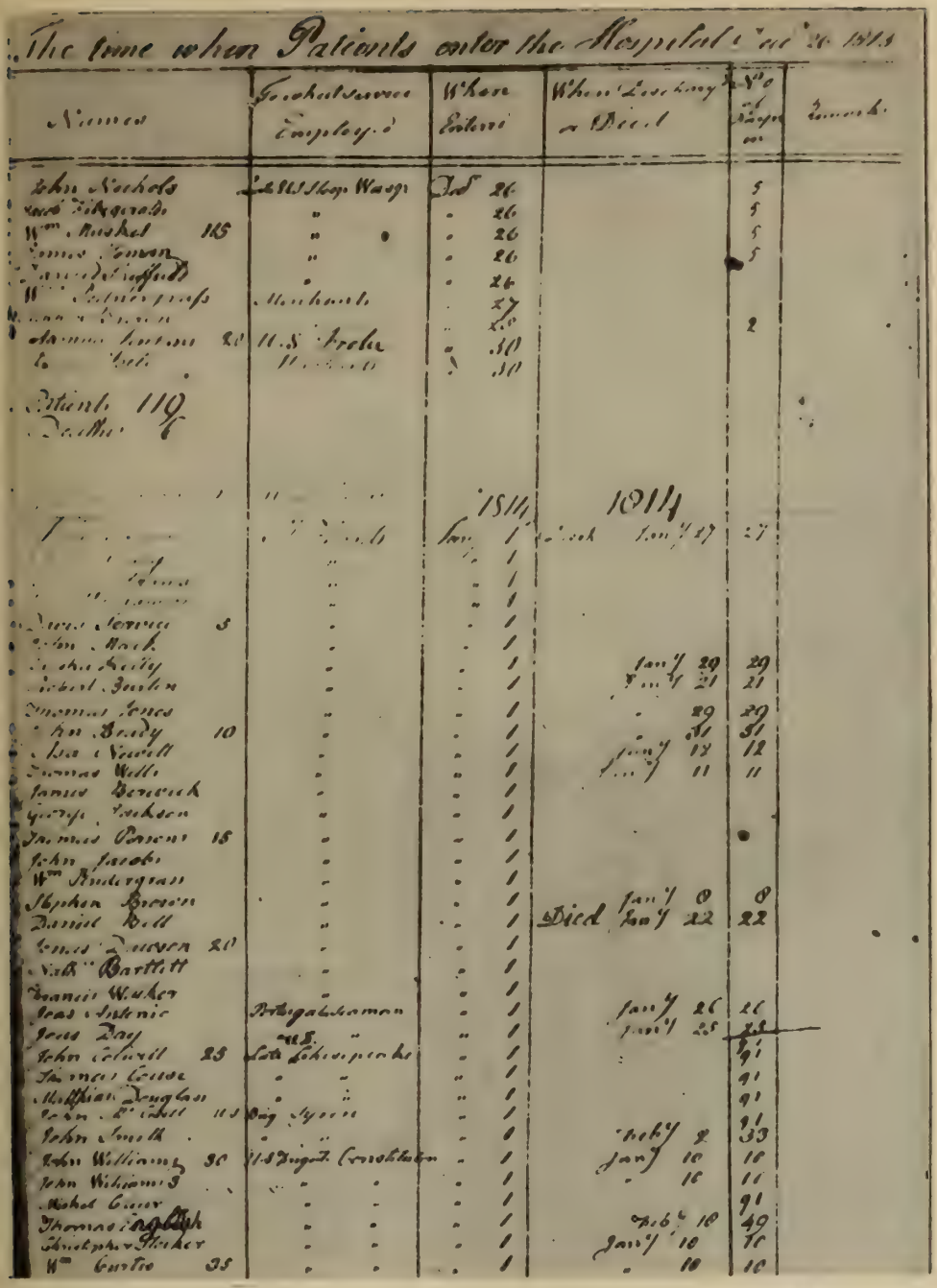
Public Interest Essential to Progress in Health

Within recent years health has become a subject of popular interest. More and more the general public is concerned about health matters. The amazing advances made in medical science within the past decade in the development of improved methods of diagnosis and treatment

are a factor in the great increase of interest in health matters. Our broader knowledge of nutrition, the effect of the vitamins, use of the sulfa drugs and the antibiotics such as penicillin, streptomycin and others, have produced very gratifying results. The public, therefore, can now look with greater confidence to the medical profession for specific and definite results of treatment for many diseases.

During the early years of the Public Health Service, there were not the present public interest and generous support for health activities from public officials, including the Congress. While in many instances there was no organized opposition in Congress toward developing public health work, an unaccountable inertia was frequently encountered which could not be overcome. Also, the functions of the Federal Government in the field of public health had not been clearly delineated. Despite these obvious adversities, the officers who furnished the leadership during the early era of public health were convinced that health was an important function of the Federal Government, and they were determined that the Service would grow to meet the medical and health needs of our nation.

Wars and epidemics have had a profound influence in awakening this country to the need of public health protection. The Spanish-American War in 1898 emphasized the woeful lack of sanitation. World War I brought the need of developing a healthy manpower as a national asset. World War II brought to public notice the importance of safeguarding and protecting the health of the entire population as well as that of the armed forces. Surgeon General Woodworth and those working with him who laid the first plans of the Service from a national standpoint, had a concept of public health and a steadfastness of purpose which enabled them to drive onward to their goal and to overcome the almost insurmountable difficulties that arose on many occasions. Fortunately, those leaders of the early days had experienced the stress of war and recognized the need of remedial measures. It was their devotion to ideals and objectives that has enabled the Service to survive and develop as it has into a truly national health service.



(From USPHS Records)

Page from register of patients, U. S. Marine Hospital, Boston, 1813, listing naval personnel, merchant seamen, and British prisoners of war.

CHAPTER X

When Wars Come

The Noblest Motive Is the Public Good.—VIRGIL

First Service Officer

THE FIRST medical officer of the Service, Dr. Thomas Welsh, served as a physician in the Continental Army during the Revolutionary War. At the time of his appointment in 1799 to provide medical care for merchant seamen at the Port of Boston, he was also under contract with the War Department to render medical services to United States troops then quartered in that city.

War of 1812

Although the Marine Hospital at Boston was intended chiefly for the use of American merchant seamen, the old, handwritten clinical records show that it was used extensively by the fighting forces in the War of 1812. One-third of the patients admitted in 1813-1815 were combatants. From the Frigate *Constitution* alone came 153 wounded or sick, and from the *Chesapeake* 86, many with scurvy returning from British prison ships. Others were sent in from the *Frolic, Wasp, Congress, President, United States Syren, Hornet, Prometheus, Adams, Macedonia, Washington, Independence, The Growler of Lake Champlain,* Gunboats 00, 01, 03, and 07, and a Revenue Cutter. There were 28 British prisoners-of-war scattered among the wards at various times. Dr. David Townsend was in charge of the Marine Hospital at Boston during that period.

The Marine Hospital at Norfolk also received officers and seamen of the United States forces during the War of 1812. From available records it appears that these two hospitals, Boston and Norfolk, were the only two Government hospitals in use at that date for the care of

officers and men of the Navy, and of merchant seamen. The early records of the Norfolk Marine Hospital cannot be located.

War With Mexico

During the war between the United States and Mexico, 1846-1848, the Marine Hospital at New Orleans was used for the care and treatment of sick and disabled troops returning from the Mexican campaign. The new Marine Hospital at that port was nearing completion and many sick, disabled, and wounded men were being returned from the military operations in Mexico for whom hospital accommodations were urgently needed. Therefore, it was a matter of necessity that the new Marine Hospital at New Orleans should be temporarily diverted from its original purpose and used for the care of sick and disabled troops returning from Mexico. Merchant seamen were provided care at a private hospital in New Orleans during the time the Marine Hospital was used by the Army.

Dr. Thomas Lawson, then Surgeon General of the Army, called upon the Secretary of the Treasury early in 1848 to urge that the new Marine Hospital at New Orleans be turned over to the Army for temporary use. The following is a note from Secretary of War William L. Marcy to the Secretary of the Treasury regarding Doctor Lawson's call:

Sec. of the Treasury 9 Feby.

Dr. Sir:

I have requested Dr. Lawson to call on you for the purpose of ascertaining if it is not possible to get for the army the temporary use of the Marine Hospital of New Orleans. It is an important matter for the Army at this time.

R. yours

W.L.M.

The New Orleans Marine Hospital was taken over by the Army in June 1848 and occupied until November of the same year, as indicated by the following letters:

Collector's Office
New Orleans
June 10, 1848

Sir:

I have the honor to inform you that I received yesterday, from Dr. C. M. Corming, Assistant Surgeon, U. S. Army, a letter, by which he informs me that he has been directed by General Brooke to occupy the new marine hospital opposite this city.

I am Sir, very respectfully,

Your obedient servant

D. PRIEUR
Collector

Honbl. W. C. Young
Acting Secretary of the Treasury.

U. S. Marine Hospital
Macdonogh, La.
20th Nov. 1848.

Honbl. R. J. Walker
Secretary of the Treasury
Washington, D. C.

Sir:

I have the pleasure to inform you that the Marine Hospital is now occupied by the sick, who were moved from Dr. Ker's hospital to this place on the 10th inst.

The house, I regret to say, was left by the soldiers in a great deal worse condition than I had expected, and it took immense labor to clean it. The floors and windows had to be scoured and washed several times, and it was impossible notwithstanding all the pains taken, to give the paint its original color. I found much difficulty in procuring white servants to clean the building, and in some instances I was obliged to pay as high as one dollar per day and board. I commenced cleaning on the 20th ultimo and by the 1st of next month I shall have everything arranged and in perfect order. The amount of servants hire will consequently be much higher the first month than it will be afterwards. * * *

Your obt. servant

WILLIAM PARKER
Superintendent

War Between the States

By the time of the outbreak of the Civil War Marine Hospitals belonging to the United States had been established at the following 27 ports:

Baltimore, Maryland
Burlington, Vermont
Burlington, Iowa
Chelsea, Massachusetts
Cincinnati, Ohio
Charleston, South Carolina
Chicago, Illinois
Cleveland, Ohio
Detroit, Michigan
Evansville, Indiana
Galena, Illinois
Key West, Florida
Louisville, Kentucky
Mobile, Alabama
New Orleans, Louisiana
Natchez, Mississippi
Napoleon, Arkansas
Norfolk, Virginia
Ocracoke, North Carolina
Paducah, Kentucky
Pittsburgh, Pennsylvania
Portland, Maine
Staten Island, New York
St. Louis, Missouri
St. Marks, Florida
San Francisco, California
Wilmington, North Carolina

All of the hospitals in the States that seceded, with the exception of those at St. Marks and Key West, Florida, were taken over by the Confederate forces and held until reoccupied by the Federal authorities. The Marine Hospitals in the States remaining in the Union were utilized by the Union military forces as necessary in providing care for soldiers and sailors.

Copies of correspondence between the Treasury Department and the Collector of Customs at Boston, Massachusetts, indicate that during the Civil War all available space in the Marine Hospital at Boston not required for merchant seamen was devoted to the care of sick and injured men of the naval forces as authorized by the Secretary of the Treasury. Dr. John W. Graves mentioned in the letter quoted below was in charge of the Marine Hospital at Boston from February 6, 1862, to August 1, 1869.

Treasury Department
April 11th 1862

Sir:

You are hereby instructed to Set apart, for the use of the U. S. Naval forces, all that portion of the Marine Hospital at Chelsea, not absolutely required for the accommodation of Mercantile Seamen, and to furnish all necessary medical attendance and supplies, If any addition to your official corps should be required it will be furnished by the Navy Department, It is proposed by that Department to pay 40 Cents a day for each patient; and you will report whether that amount would meet the requisite outlay, If you consider it inadequate, you will suggest the proper allowance,

The entire supervision of the building will continue, as usual, in yourself, and you will report its condition, from time to time as you may deem advisable,

Dr. Graves will exercise general control over all sanitary arrangements, after consultation with the Naval Surgeon, You will keep a separate account in triplicate of the expenditures growing out of this arrangement, and submit, monthly, triplicate statements setting forth the names of the patients, of the vessels whence received, number of days in the hospital, and amount due in each case, one of these statements to be transmitted to the Secretary of the Navy. and another to the Treasury Department. These statements are to be jointly certified by the Naval Surgeon and yourself All expenses growing out of or attendant on this transfer will be paid by the Navy Department, In all things relating to this Joint occupancy you will consult with the Naval Surgeon, and promote harmonious Cooperation. You will report the date on which the arrangement is Consummated.

I am Very Respectfully

GEO. HARRINGTON
Acting Secretary of the Treasury

J. Z. Goodrich Esq.
Collector
Boston
Mass.

Another letter written two years later indicates that the Marine Hospital at Boston was still extensively used for the care of Naval patients. It is quoted below:

Treasury Department
July 18—1864

Sir:

The great increase in the number of Naval Seamen in the Marine Hospital, may encroach perhaps a little too much on the comfort of those legitimately entitled to accommodation, but the Secretary, desires you to extend every facility in your power to Seamen of the Navy as well as of the Marine, The expenditures rendered necessary by these arrangements, you will keep an accurate account of, with Vouchers, and you will be duly reimbursed therefor by the Navy Department, You will, however, always present estimates for required outlay before making any purchases which must previously be Authorized by the Secretary, Your recommendations of the purchase of 100 Sheets is approved by the Secretary, provided the cost thereof does not exceed, Two Hundred and fifty dollars;

I am Respectfully,

M. B. FIELD
Asst Sec Treasury

During the latter part of the Civil War, the management of the Marine Hospital at Burlington, Iowa, was turned over to the Medical Director of the Department of the Northwest U. S. Army. About the conclusion of the war, this hospital was closed. At the outbreak of the Civil War, the Marine Hospital at Cincinnati, Ohio, was prepared for the reception of wounded soldiers. The War Department retained possession of the hospital during the continuance of the war.

In 1862, the Marine Hospital at Evansville, Indiana, was converted into a general military hospital. The Marine Hospital at Louisville, Kentucky, on May 1, 1863, was converted into a military hospital for the reception of sick and wounded soldiers of the U. S. Army. It was again opened for merchant seamen on September 20, 1869. At St. Louis, Missouri, during the Civil War the Marine Hospital was used as a military hospital and in order to increase the capacity, barrack wards were erected on the north side of the main building. From May 4, 1862, to June 1866, 4,598 soldiers were admitted for treatment. On September 25, 1866, the hospital was returned to the Marine Hospital Service and the care of sick and disabled seamen was resumed.

The Marine Hospital at Vicksburg, Mississippi, escaped destruction during the siege of that town. After the capture of the city by the Union forces, the hospital was taken over by the Medical Department of the U. S. Army. The Marine Hospital at Mobile was used by the Confederate Army as a military hospital until the surrender in 1865. After the surrender it was used by the U. S. Army for the same purpose. At Wilmington, North Carolina, the Marine Hospital was used by the Confederate Army until the close of the war.

The Marine Hospital at Charleston, South Carolina, was used by the Confederate forces as a hospital during the Civil War. This hospital was sold at public auction in 1866. At New Orleans, Louisiana, the Marine Hospital was used for military purposes by the Confederate Army. After occupation of that city by the U. S. Army, the Marine Hospital was used as a barracks and was temporarily transferred to the Freedmen's Bureau for use as a hospital in 1865.

The Marine Hospital at Norfolk, Virginia, was used as barracks for the Confederate troops during the Civil War and at the close of the

war was used as a hospital by United States troops. After the building was evacuated by the U. S. Army, it was not again opened as a hospital. It later became a school and still later was used for commercial purposes. There was no Marine Hospital at Norfolk following the Civil War until 1922 when one was erected there.

War With Spain

Soon after war was declared against Spain in 1898, all Marine Hospitals were made available for the care of the sick and wounded of the Army and Navy. The prevention of the introduction of yellow fever by troops returning from Cuba and Puerto Rico was of great concern to the Marine Hospital Service. Medical officers of the Service were assigned to Cuban and Puerto Rican ports to carry out the requirements of the United States quarantine regulations. A medical officer of the Army or of the Marine Hospital Service was assigned to each transport carrying troops between Cuba, Puerto Rico, and the United States from August 1898 to April 1899. Medical officers of the Service assigned on Army transports were Drs. Arthur R. Thomas, Sherrard R. Tabb, John McMullen, Samuel B. Grubbs, Herman B. Parker, Leslie L. Lumsden, Lunsford D. Fricks, Claude H. Lavinder, J. Spencer Hough, Thomas B. McClintic, and E. F. McConnell. The duties of these officers were to require certificates of freedom from infection of all passengers and troops coming aboard the transport, and with the cooperation of the ship's master to prevent members of the crew from going ashore. These medical officers were also expected to give general supervision to the sanitation of the ship, with especial reference to the water supply and its source. Medical care to returning troops was usually provided by medical officers of the Army; however, if no such officer were present aboard the transport, the Marine Hospital Service officer provided the necessary medical attention.

Dr. Joseph B. Greene, a medical officer of the Service, was on duty aboard the Revenue Cutter *McCullough* which was with the fleet of Commodore George Dewey at the battle of Manila Bay in 1898.

A temporary Service quarantine station for returning troops from Cuba and Puerto Rico was established at Montauk Point on Long Island,

New York, under the direction of Dr. George M. Magruder. Returning troops, prior to proceeding to their destinations, remained at this station for the incubation period of yellow fever and for the disinfection of their baggage. The first transport, the *Gate City,* arrived at the quarantine station from Santiago, Cuba, on August 13, 1898. Seventeen thousand troops, 2,200 of whom were sick, were returned from Santiago to the United States via Montauk Point. Four of these men had yellow fever.

Returning troops from Cuba were also received at the Service detention camp at Egmont Key, near Port Tampa, Florida, which was under the charge of Dr. Paul M. Carrington.

In all, more than 30,000 returning troops were inspected at quarantine stations by medical officers of the Marine Hospital Service.

The War with Spain emphasized the need for defining the functions and status of the Service during actual or threatened war. As a consequence, the reorganization Act approved July 1, 1902, contained the following provision:

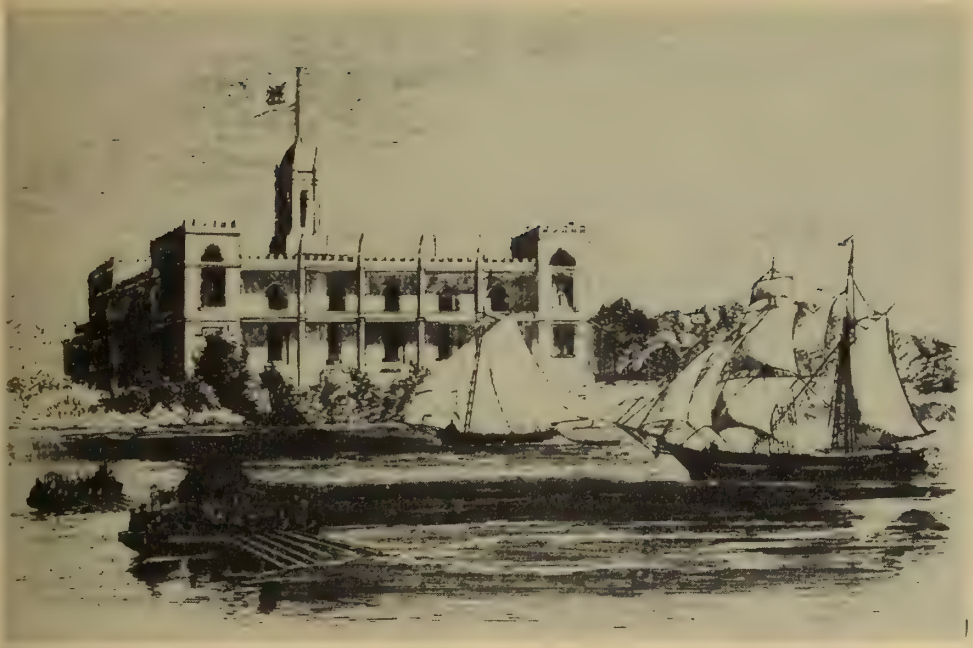
> That the President is authorized in his discretion to utilize the Public Health and Marine Hospital Service in times of threatened or actual war to such extent and in such manner as shall in his judgment promote the public interest without, however, in any wise impairing the efficiency of the Service for the purposes for which the same was created and is maintained.

World War I

When entrance of the United States into World War I was imminent, Surgeon General Rupert Blue convened a board of officers to outline the war activities for which the Public Health Service was especially fitted by reason of the training and experience of its personnel. This board submitted a report dated February 4, 1917, recommending a program of war activities which the Service was prepared to undertake. In brief, the recommended program included:

(1) The sanitation of ports and places within the United States in order to prepare them for camps of mobilization, concentration, or training for the Army or Navy.

(2) The sanitary supervision of mobilized industrial forces.



(Courtesy Howard-Tilton Library,
Tulane University, New Orleans, Louisiana)

Marine Hospital, New Orleans, 1861.

(From USPHS Records)

Special Quarantine Station, Montauk Point, New York, 1898.

LEFT TO RIGHT: *Drs. Mark J. White, William Brunner, Hugh S. Cumming, George M. Magruder, Sherrard R. Tabb, Ezra K. Sprague, Mathew K. Gwyn.*

(From USPHS Records)

Savannah, Georgia, 1899, conference between officers of the Marine Hospital Service and the Army regarding quarantine procedures for U. S. Troops returning from Cuba.

1. Dr. Julius O. Cobb; 2. Dr. Milton H. Foster; 3. Dr. Rudolph H. Von Ezdorf; 4. Dr. Alfred C. Smith; 5. Colonel Bellinger, in charge of Quartermaster Depot, U. S. Army; 6. Capt. R. S. Warner, Superintendent O. T.

(From USPHS Records)

Sixth Ohio Volunteer Infantry (850 men and 50 tons of baggage) recently returned from Cuba, coming from Quarantine Detention Camp, Daufuskie Island, South Carolina, to Savannah, Georgia, 1899, having cleared quarantine by the Marine Hospital Service.

(3) Medical and surgical relief to sick, wounded, or disabled soldiers and sailors at stations of the Service.

(4) Medical and surgical relief to mobilized industrial workers.

(5) Laboratory operations including both research and manufacture of serums and vaccines.

This was supplemented by a memorandum dated April 7, 1917, outlining desirable activities of the Service in the field of industrial hygiene, especially those related to war industries.

In order to coordinate the war activities of the Public Health Service with the operations of the military and naval forces, the President issued an Executive Order April 3, 1917, constituting the Public Health Service a part of the military forces:

EXECUTIVE ORDER

Under the authority of the Act of Congress approved July 1, 1902, and subject to the limitations therein expressed, it is ordered that hereafter in times of threatened or actual war, the Public Health Service shall constitute a part of the military forces of the United States, and in times of threatened or actual war, the Secretary of the Treasury may, upon request of the Secretary of War or the Secretary of the Navy detail officers or employees of said Service for duty with the Army or the Navy. All the stations of the Public Health Service are hereby made available for the reception of sick and wounded officers and men or for such other purposes as shall promote the public interest in connection with military operations.

WOODROW WILSON

The White House
April 3, 1917

Under authority of this Order, at the request of the War Department, Dr. Joseph H. White and Dr. W. Colby Rucker were assigned to duty with the U. S. Army.

With the issuance of the Executive Order quoted above, the Service was considered to be a part of the military forces. An opinion by the Attorney General dated October 29, 1921, held that the power to create a military force out of a civilian source is a duty residing in Congress alone, and that under existing law the President could "utilize" but not

convert the Service to a military force within the meaning of the definition "military or naval forces of the United States."

Even before a state of war was declared, a number of officers were serving on Coast Guard vessels which were cruising in the war zone. Recognizing the danger to which these and other officers would be exposed in the future, Congress passed a joint resolution approved July 9, 1917, fixing the status and rights of Service officers when serving with the Coast Guard, the Army, or the Navy, as follows:

JOINT RESOLUTION TO FIX THE STATUS AND RIGHTS OF THE PUBLIC HEALTH SERVICE IN SERVING WITH THE COAST GUARD, THE ARMY, OR THE NAVY

Resolved by Senate and House of Representatives of the United States of America in Congress assembled that when officers of the United States Public Health Service are serving on Coast Guard vessels in time of war, or are detailed in time of war for duty with the Army or Navy, in accordance with law they shall be entitled to pensions for themselves and widows and children, if any, as are now provided for officers of corresponding grade and length of service of the Coast Guard, Army, or Navy as the case may be and shall be subject to the laws prescribed for the government of the Service to which they are respectively detailed.

Approved July 9, 1917.

A total of seventeen medical officers were assigned to duty with the Coast Guard in the war zone.

It soon became evident that the peacetime personnel of the Service was numerically inadequate to meet the new demands and requests from other Governmental agencies for the detail of officers and for the performance of public health services. Surgeon General Blue, therefore, directed the preparation of a bill having as its purpose the creation of a Reserve Officer Corps for the Service. This bill passed the Senate on June 8, 1917. It was not acted upon promptly by the House of Representatives and did not become law until October 27, 1918. The failure of this bill to pass promptly hampered the Service in securing a sufficient number of trained professional personnel during the period of greatest need.

Doubts were created in the minds of many persons who might have entered the Service as to their probable military status. Those physicians

and other professional workers who came into the Public Health Service were handicapped in their work owing to the fact that the Service could not then provide rank commensurate with their important duties and official relationships in the cantonments and extra-cantonment zones or elsewhere. In spite of these handicaps the Service expanded to meet the needs as outlined in the above program. At the close of the fiscal year on June 30, 1917, the professional personnel numbered 538, whereas on June 30, 1918, the total was 1,472.

In reviewing the activities of the Public Health Service in World War I, it is recognized that the Service acquitted itself with credit and never failed to meet adequately any of the emergency situations with which it was presented. It would have been a decided advantage to the Service and to the war effort if a plan clearly establishing the military status of Service officers had been developed before or promptly after the declaration of war. Within the Service itself there was a strong controversy between groups of officers holding diametrically opposed viewpoints. One group contended that the Service must maintain itself as an entity and strongly opposed any plan for the Service to be absorbed by the military forces. They felt that should the Corps be merged with the Army or Navy the Service would be completely dissolved never to regain its identity. The contrary viewpoint was that it made no difference as to whether or not the Service was absorbed into the Army or Navy during the emergency. This group did not share the feeling that the Service might thereby lose its organizational identity. A majority of the professional personnel of the Service were eager to be placed definitely in the military forces, feeling that this action would remove many of the handicaps under which they labored because of their indefinite status, and thereby better enable them to perform their public health duties.

Differences of opinion as to policy in regard to the program outlined continued to develop difficult situations; for example, the medical department of the Army felt that it should have control of the sanitation of the extra-cantonment zones, though from the beginning the Public Health Service had a corps preeminently suited for this work because of its experience in this field and by reason of relationships

through the years with State and local health authorities. Despite this, in several instances the Army almost succeeded in compelling the Service to yield control of extra-cantonment sanitation.

On the other hand, the operation of the selective service draft act began to cause the officers of the Service within the draft age to feel some embarrassment. While the regulations of the Provost Marshal General exempted Service officers, the language was indefinite. It was so indefinite that some officers registered under the act and some did not.

The attitudes of some of the public health leaders of the country began to add uncertainty to the position of the Service. Conditions grew more acute, especially when an increasing number of officers began to be detailed to the Army, Navy, and Coast Guard. Some of the officers not so detailed requested definite military duty. When their requests were denied, many of them asked for leave of absence to enter military service. Refusal to grant such leave caused the submission of resignations to such an extent that the Service was forced to adopt a definite policy of refusing to accept the resignations of commissioned officers.

In November 1917, a committee of officers submitted a memorandum to Surgeon General Blue stating that the commissioned corps of the Public Health Service in its entirety should be ordered for duty either under the Army or the Navy. This memorandum was signed by four of five officers elected as a committee to represent the commissioned corps. One member declined to sign and submitted a minority report. The memorandum presented to Surgeon General Blue by the committee is as follows:

November 13, 1917

MEMORANDUM FOR THE SURGEON GENERAL.

The Executive Committee of the Mutual Benefit Association of the Public Health Service in a meeting held November 12, 1917, presents the following resolution for consideration:

Resolved, That it is desirable and in the interest of the Nation that the U. S. Public Health Service in its entirety be ordered for duty either under the Army or the Navy for the duration of the war in accordance with the authority provided by Executive Order of April 3, 1917, constituting the U. S. Public Health Service a part of the Military Forces of the United States.

The Committee has adopted the above resolution believing that such action would in no way impair the efficiency of the Service for the performance of its civil functions, and would at this time be of material aid to the Sanitary Corps of the Army in the maintenance of hygienic conditions for the military forces and the war industries. The reasons that such results may be expected are briefly as follows:

1. There would at once be effected a greater degree of coordination of the work now in progress for the sanitation of the cantonments and the extra-cantonment zones. It would make it possible for one executive head to administer the sanitary matters for both areas, backed by military authority to speedily enforce all reasonable regulations.

2. Under the military necessity of protecting the health of the troops stringent regulations could be promulgated and war funds used for correcting insanitary conditions.

3. The detail of the Service as proposed would give a greater field of usefulness in the work for improving hygienic conditions under which the industrial army is now serving. The military authorities could make their contracts for war materials subject to supervision by the Sanitary Corps.

4. The Marine Hospital reservations would offer convenient sites for the erection of a large number of temporary wards, administered from present executive buildings.

5. The quarantine service now adjusted to civil needs will necessarily have a much greater strain placed upon certain stations when large bodies of sick and disabled troops are returning to the United States. Proper coordination of the quarantine with the military needs would be greatly facilitated if both are controlled by the same department. Furthermore, with the War Department responsible for the quarantine function that Department would have a greater interest in the enforcement of proper protective measures.

6. The enforcement of interstate quarantine regulations, especially those relating to the movement of troops and food supplies, would be easier. This would necessarily add greatly to the protection of both the civil and military population.

7. Through the existing laws and regulations for the cooperation of national, State and local health authorities the military and civil health authorities would be brought into closer relations which would doubtless improve on the work of both.

8. Under the existing crisis it is believed that every person should render the greatest service to the Government that he is capable of performing, no matter at what sacrifice, and it seems to the Committee that the Service and its personnel could be utilized to a greater degree of efficiency as outlined above without in any way impairing the purposes for which the Service was created and is maintained.

9. In this way it would be possible for the personnel of the Corps to engage in active military duty, and each would have the greatest satisfaction in the knowledge

that he had a recognized share in winning the war. It would also be a source of pride to each to know that he had given his best service to his country.

10. A definite military status with a maximum of service during the war would greatly add to the development of the Service after the war is over.

11. The experience gained by war duties would not only develop the present personnel, but also a large additional force of trained sanitarians, who will be ready to cooperate with the Service in civil health duties.

12. The Service, having served creditably during the war as a part of the military forces, would, when peace is declared, automatically revert to its present civil status and would naturally bring with it the large force of trained sanitarians who will then be giving up their active duties with the Army. It will be easy to take over such a force as there will be plenty of civil health duties for all, and Congress will not hesitate to reward them for their services provided it can be done in the best interest of the public health.

13. A number of these would doubtless desire to return to their respective States and could there be utilized to great advantage by State and local health organizations. This would build at once a compact, disciplined, and efficient working health organization for the United States composed of men who are comrades from the great war.

The Committee believes this memorandum deserves most earnest consideration, and also believes the proposed detail of the Service to the War Department to meet the approval of at least 80 per cent of the personnel of the Corps. Furthermore, it is our desire that appropriate action be taken at the earliest practicable date, under such arrangements as may be determined upon in order that the detail may be effected without delay.

(Signed) J. C. Perry, *Chairman*
Senior Surgeon

H. S. Cumming
Surgeon

Edward Francis, *Secretary*
Surgeon

B. S. Warren
Surgeon

Surgeon L. L. Lumsden voted against this resolution and submitted a minority report as follows:

November 16, 1917

SURGEON GENERAL
U. S. Public Health Service
Washington, D. C.

Sir:

I have the honor to state that it is to me a matter of regret that the Executive Committee of the Mutual Benefit Association of the Public Health Service can not reach a unanimous agreement on the plan of administration of the Public Health Service which would promise to be most effective in the present national crisis.

The majority of the Committee today adopted the following resolution:

RESOLVED, That it is desirable and in the interest of the Nation that the U. S. Public Health Service in its entirety be ordered for duty either under the Army or the Navy for the duration of the war in accordance with the authority provided by Executive Order of April 3, 1917, constituting the U. S. Public Health Service a part of the Military Forces of the United States.

I could not concur in this resolution because I believe that the Public Health Service administered as a Bureau of the Treasury Department working singlemindedly as a homogenous health organization of the Federal Government can be more effective in helping our one hundred million people to win the war, in which not only the military forces but the whole nation is engaged, than it could be if it were transferred to and made an integral part of or disseminated among the military forces of the Army or the Navy.

Some of the reasons for this belief are as follows:

1. The strength of our fighting force will depend upon the extent of our resources and the degree of intelligence exercised in the use of our resources.

2. The fighting force must be fed, clothed, trained, equipped with the machinery of war, and transported from place to place.

3. We will need to "speed up" our human energy and do all possible to prevent lost motion.

4. The conservation of the health of our people is now more important to our nation than ever before.

5. We can less afford to have our people crippled or killed by preventable disease than ever before.

6. The maintenance of the highest degree of efficiency possible among our laborers in factories, fields, forests, and mines and on railways and ships is a vitally important part of the war business.

7. Some of the thousands of children of this country who, under existing conditions, within the next 12 months will die from readily preventable diseases may be needed at the battlefront before the war is won.

8. Sanitation of civilian communities is a war measure of great importance.

9. The conduct of a nation-wide reasonably adequate campaign for sanitation would be a big business.

10. The Public Health Service with its present laws, trained personnel and equipment is the logical nucleus around which to build up an adequate national health organization and through which to have coordinated the activities of State, county and municipal health organizations.

11. If sanitation of civilian communities were presented to the people as a war measure along the same general lines as the food conservation propaganda recently has been presented, our vital capital would be tremendously increased in a very short time.

12. Specialization is necessary to efficiency. The sanitation of civilian communities requires work involving principles different from those for the sanitation of military establishments. Each is a specialty for the proper performance of which special training is necessary. The Army and Naval Medical Corps are the logical nucleus around which to build up adequate organizations to look after the sanitation of the military establishments. To place upon either of them, with their proper functions already demanding their utmost energy, the administration of the Federal Government's part in civil health work, for which the Public Health Service is created and is maintained, would seem opposed to the principles of administrative efficiency.

13. The Public Health Service personnel is trained in the principles and practices of sanitation under civilian conditions and untrained for duty under military conditions. To take them in any considerable proportion from duties of vital importance for which they are trained and give them duties of equal importance for which they are untrained would necessarily result in lost motion. The Service is now doing remarkably effective work, in view of the size of the force engaged, for the protection of the health and lives of the soldiers and sailors in our national camps. From close observation of the sanitary work in twelve of the extra-cantonment areas it appears highly improbable that the officers engaged in this work could be as effective if they were a part of the Army or the Navy as they are in their present capacity.

14. Personal satisfaction in having meritorious service recognized is not so important to the nation as is having meritorious service performed. With Public Health Service officers as with all other Americans the question now is not what we wish to do but what we ought to do.

If the work of the Public Health Service as a public health service with its remarkable spirit of team work manifested in its fights against epidemics of yellow fever and bubonic plague and against insanitary conditions in our vast rural districts ever were needed that time is now. It seems, therefore, that instead of urging that the Public Health Service in its present capacity is incompetent or even useless, as

the resolution adopted by the majority of the Committee appears to me to do, we should endeavor with the assistance of the many forces which have been trying to help us to have the Service strengthened and its efficiency raised to the highest possible point so that we may do well the great war work which is ours to do.

Respectfully,

(Signed) L. L. LUMSDEN, *Surgeon*

The status of the Service in this regard not only was receiving the serious attention of its officers as is set forth above, but also the consideration of prominent medical and public health men of the country, as is evidenced by a memorandum submitted January 2, 1918, to Dr. Franklin H. Martin, Chairman, Committee on Medicine and Sanitation, Advisory Commission, Council of National Defense, and sent by Dr. Martin to the Secretary of War.

Dr. Martin states in his letter transmitting the memorandum that the consensus of the Executive Committee of the General Medical Board of the Council of National Defense was in favor of the transfer of the Public Health Service to the Medical Department of the Army. This Board consisted of the Surgeon General of the Army, Surgeon General of the Navy, Surgeon General of the Public Health Service, Dr. William H. Welch, Dr. F. F. Simpson, and Dr. Franklin Martin. The letter of transmittal and memorandum follow:

January 10, 1918

HONORABLE NEWTON D. BAKER, Chairman
COUNCIL OF NATIONAL DEFENSE
War Department
Washington, D. C.

My dear Sir:

Based upon the accompanying memorandum, I am submitting the following proposed order with the recommendation that it be considered by your body and if approved that it be called to the attention of the President for his consideration and action.

Under the authority of the Act of Congress approved July 1, 1902, in order that the United States Public Health Service may be utilized during the existing war to such an extent and in such a manner as shall promote the public interest, without in any wise impairing the efficiency of the Service for the purposes for which the same was created and is maintained; and that the health service of the nation and

of its Army may be coordinated, it is ordered that, for the period of the war and the revocation of this order, the Public Health Service shall constitute a part of the military forces of the United States and that the Surgeon General and other officers and the enlisted personnel and employees thereof, report to the Surgeon General of the Army for duty; and the powers, duties and functions of the Service are transferred to and vested in the Surgeon General of the Army, who is hereby charged with the responsibility for the health of the Army and of the nation upon which that of the Army depends, during the war and fully authorized to use such agencies as are under his control for the preservation of the public health and the national efficiency dependent upon health.

1. Please note that the accompanying memorandum is signed by Victor C. Vaughan, President, Michigan State Board of Health, A. J. Ochsner, Regent of the American College of Surgeons, W. J. Mayo, President of the American College of Surgeons, Seale Harris, Secretary of the Southern Medical Association, Arthur T. McCormack, State Health Officer of Kentucky, and C. H. Mayo, President of the American Medical Association.

2. The within recommendation has been approved by the Surgeon General of the Army and the Surgeon General of the Navy.

3. The subject matter of this recommendation has been discussed at various times by the Executive Committee of the General Medical Board of the Council of National Defense, consisting of the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Public Health Service, Dr. William H. Welch, Dr. F. F. Simpson and myself, and it has been the consensus that the arrangement suggested in the accompanying memorandum is not only desirable as a war measure but also authorized by law.

4. Please note at the end of the memorandum (a) the law on this subject was enacted on July 1, 1902, and (b) an executive order by President Wilson on April 6, 1917.

Respectfully submitted,

(Signed) FRANKLIN H. MARTIN, *Chairman,*

Committee on Medicine and Sanitation of the Advisory Commission of the Council of National Defense.

January 2, 1918

MEMORANDUM:

1. In time of war everything must be so coordinated as to win. The evident strategy of a national service in war recognizes cantonments and other military rendezvous as the centers from which or toward which a continuous stream of non-immunes to the various infectious diseases flows. The duty of a national health service in time of war is (1) to prevent the spread of disease to, into, or from the military forces; and (2) to accomplish this end more readily, they should keep in constant, intimate

touch with local civil health authorities so they may know the geographical distribution of endemic and epidemic communicable diseases, and, in cases when any of them threaten the efficiency of the military forces and the local authorities are not able to control it, the national health service should render such assistance and assume such control as may be found necessary. (3) Maritime and internal (railroad) commerce in time of war are controlled by the Commander-in-Chief of the Army. Civil interference with troop movements is impractical. Maritime and inland quarantine of troops and non-combatant forces is essential to national health. (4) A considerable percentage of men of draft age are rejected because of remediable defects, such as trachoma, malaria, or hookworm disease. Such men should be assembled in existing marine hospitals and cured with a view to increasing the number and effectiveness of first line troops. This is impracticable unless such institutions are under military control.

2. At present health in the Army is under the control of its Surgeon General with the personnel of its Medical Corps. He must expand, organize and train a sanitary corps to protect the troops, 3% of the people of the country. The United States Public Health Service, with personnel wholly inadequate in numbers and without enough money, has charge of the national health problems affecting these troops directly as well as of the remaining 97% of the civil population, including in the latter the farmers, laboring men in railroads, boats, munition plants, and elsewhere, whose health and efficiency are essential to success. It is in touch with the State and local health organizations.

3. Communication between co-ordinate authorities in different departments involves delay and inefficiency, both fatal to successful health administration.

4. Military control of civil conditions is abhorrent to our traditions and institutions in time of peace. In time of war all of the authority and responsibility for a particular branch necessary to win should be centered in one officer as near as possible to the Commander-in-Chief. Complexities must be removed.

5. For the period of the war, the Surgeon General of the Army should be given ample authority and held strictly responsible for the national health and the nation's efficiency so far as efficiency is dependent upon health.

6. For the period of the war, the personnel, duties, powers and functions of the United States Public Health Service should be transferred to and vested in the Surgeon General of the Army, as provided by law. Its hospitals, quarantine stations, interstate and maritime quarantine functions, including extra-cantonment zone work would continue as transferred. Many trained sanitarians in charge of routine or hospital work could be replaced by Medical Corps men qualified for such work. The trained sanitarians and executives of the Health Service would not only supply much needed sanitary inspectors and other sanitary executives for armies and divisions, but, also, because of their trained experience could multiply their usefulness as in-

structors to sanitary officers and troops and by detail to them of officers and men who would become of greatly increased value under such guidance. The usefulness of such an organization does not need to be amplified.

7. It must be recognized that the relations between the United States Public Health Service and the Secretary of the Treasury have been pleasant to both and effective in the national health service as limited in times of peace, and that it is not the purpose of this suggestion to remove the Service from the Treasury Department nor its control. It is simply desired to galvanize the sanitary service of the nation and the Army under one head by the incorporation in it of the personnel and functions of the health arm of the government during the war. In order to secure for the personnel of the United States Public Health Service the rank—i.e., the War Department's stamp of individual evaluation so each can accomplish the results for the nation for which he is best equipped—it is desirable that, for the period of the war, officers of the Service be given rank in the Army as of the age of their commissions.

8. The advantage to the personnel of the Service participation in the successful administration of the national sanitary service, required to win the war, in which civil and military sanitation is indivisible, and the possible incorporation with it after the war of the needed additional sanitary officers who will have been trained by them, needs but be suggested.

9. The Medical Corps of the Army is able to secure the services of enough qualified medical men from civil life to man its hospitals and care for its sick and wounded with a minimum of hardship for the people of any community. There is no state or municipal sanitary organization from which trained sanitary technicians can be drawn without great danger to national health. The only way in which the national health service may be quickly made adequate in the existing emergency is by the elimination of all lost motion and the combination and coordination of all existing national health agencies under the direction of the Surgeon General of the Army for the period of the war.

(Signed) Victor C. Vaughan
Pres., Mich. State Board of Health

A. J. Ochsner
Regent of the American College of Surgeons

W. J. Mayo
Pres., American College of Surgeons

Seale Harris
Secretary, Southern Medical Association

Arthur T. McCormack
State Health Officer of Kentucky

On January 11, 1918, the memorandum proposal was taken to the Cabinet meeting. Since the Secretary of the Treasury was not present at the meeting, action was deferred pending the submission of his comments. The Secretary of War therefore addressed the following note to the Secretary of the Treasury.

January 11, 1918

My dear Mr. Secretary:

I beg leave to hand you herewith a memorandum signed jointly by a good many distinguished medical men involving the proposed emergency coordination of the Public Health Service with the Office of the Surgeon General of the Army. I took this paper to the Cabinet meeting today and brought it to the attention of the President with the statement that I did not ask any consideration for it until it had been submitted to you and approved by you. I am told that the Surgeon General of the Public Health Service is not averse to the plan here suggested. The President asked me to bring the matter to your attention so that his consideration of it could be in the light of any comments you may make on the plan proposed.

Cordially yours,

(Signed) Newton D. Baker
Secretary of War.

The Honorable
The Secretary of the Treasury.

In his reply the Secretary of the Treasury accepted the minority view of the officers of the Public Health Service and declined to approve the transfer of the Service as a whole to the Army. He quoted an old act of Congress as prohibiting it, though he did state that it would not prohibit the securing of Congressional approval if he had thought it was justified in the public interest.

Evidently he concurred in the opinion of some of the officers that the Service would be broken up and its personnel detailed to other duty.

His letter follows:

February 8, 1918.

My dear Mr. Secretary:

I have your letter of the 11th of January, enclosing a letter from Dr. Franklin Martin, Chairman of the Committee on Medicine and Sanitation of the Advisory Commission of the Council of National Defense, proposing the coordination during the period of war of the Public Health Service of the Treasury Department with the office of the Surgeon General of the Army, including the transfer of the personnel

and functions of the former to the latter. I have given careful consideration to the question and am firmly of the opinion that the change should not be made.

The suggestion is based on Section 4 of the Act of Congress approved July 1, 1902, which authorized the President, in his discretion, to utilize the Public Health and Marine Hospital Service in time of threatened or actual war to such an extent and in such manner as shall in his judgment promote the public interest without, however, in any wise impairing the efficiency of the Service for the purposes for which the same was created and is maintained.

Section 12 of the Act of Congress approved February 14, 1903, entitled "An Act to Establish the Department of Commerce and Labor," authorized the President, by order in writing, to transfer to any part of any office, bureau, division or branch of the public service engaged in statistical or scientific work, from other departments to the new Department of Commerce and Labor. A short time thereafter some objections arose to the possible transfer of the Bureau of Public Health and Marine Hospital Service from the Treasury Department to the Department of Commerce and Labor. Accordingly, an Act approved March 18, 1904, provided, ". . . and said Service shall remain under the jurisdiction of the Treasury Department until otherwise hereafter specifically provided by law." (Vol. 33, Part I, U. S. Stat. at Large, p. 104).

Inasmuch as it appears that no such specific legislation has since been enacted, the Solicitor of the Treasury expressed the opinion that the proposed transfer of the Service or any of the functions by executive order is prohibited by the clause contained in the Act approved March 18, 1904.

The above relates to the legal aspect of the question and while this is immediately controlling, it is not fundamental because if the proposed change were justified in the interest of public welfare, the matter could be presented to Congress and an effort made to obtain the necessary legislation to remove the restriction. My primary objections to the proposed transfer are based on other grounds.

To win this war, everything must be done that possibly can be done to mobilize the might of the nation and raise our military, industrial and economic forces to the point of the highest efficiency. From the standpoint of the public health this applies not only to the Army and Navy, but to our population as a whole from which the Army and Navy are drawn and from which they receive their sustenance and support. It applies in equal measure to the workers in our factories, our fields, our forests, our mines, on our railways, and on our ships. There is no more important function of the Government at this time than the protection and improvement of the public health.

It has been stated that the Medical Corps of the Army has, or will have, jurisdiction over the health of approximately three percent of our population. It examines and passes upon the physical condition of the men entering the Army, and is responsible for the health of the soldiers, the sanitation in the camps, and the care

of the sick and wounded. The Public Health Service, in cooperation with State and local health officials, is doing its utmost to protect and improve health conditions around the cantonments, the health of laborers and the people generally and the sanitation of the country.

The Medical Corps of the Army plays a very important part in connection with our efficiency as a belligerent; the Public Health Service performs duties and exercises responsibilities of equal importance in the same connection. The functions of these two services, however, are entirely distinct. They do not conflict or overlap and there is no division of responsibility in any sense. On the contrary, they complement each other. The jurisdiction of the one lies entirely within the Army and Army camps; the jurisdiction of the other stops at the gates of every camp and cantonment. In these circumstances, they need no coordination further than that which now exists for the reason that they are already effectively coordinated under the President.

Instead of transferring the functions of the Public Health Service to the War Department, I am firmly convinced that they should be strengthened and enlarged so as adequately to protect the health of the nation and thereby increase our efficiency in every activity of the war. With ample authority and funds, this will also result in improving the health and physical condition of our manhood for the purposes of the Army.

In a communication dated May 21, 1917, this Department recommended additional legislation to the Congress. On the 26th of December, I also addressed a letter to the Chairman of the Committee on Interstate and Foreign Commerce of the House of Representatives, urging immediate and favorable action. I quote from the latter communication in part, as follows:

"Since the action by your Committee, the seriousness of the situation has increased. There is immediate need therefore of the means which this measure will provide to coordinate the health forces of the country and to render their efforts more effective in meeting the present situation. By reason of the establishment of military camps and the development of unusual activities on account of the war, many localities are faced by new local problems which they are unable alone to meet.

"On account of the location of many of the military camps in malarious areas, some of them highly so, and because of the greatly increased travel to and from these areas, measures for the control of this menace are necessary. Any measures, to be effective during the coming season, must be taken immediately. This preventive work, not only to control malaria but other communicable diseases liable to spread in interstate traffic will need to be performed in civil areas over which the military forces have no jurisdiction.

"The control of veneral diseases is likewise pressing. More than 260 per 1,000 of a large group examined for the new national Army were said to be so affected. They are even more diffuse in character and dangerous than the gases of any enemy.

Their undue prevalence is certain to affect adversely the prosecution of the war and to undermine the health of large numbers of individuals. They present the gravest of all public health conditions. In order to meet this condition, there must be coordination of effort on the part of the Federal, State and local health agencies."

In this connection, I should point out that there are pending two bills, one for the creation of a Public Health Reserve, and appropriating $2,000,000 for the purpose, and the other appropriating $600,000 to increase the personnel of the Service and afford adequate means of investigating and improving the health and working conditions in munitions plants, and all other industrial establishments necessary to the conduct of the war.

To equip the Service adequately for war purposes, its normal functions have been reduced in some directions, increased in others, and new activities have been undertaken. Some of the important things which the Service is doing, or proposes to do, are:

(1) Coordination of Federal, State and local health forces.
(2) Sanitation of ports and places, including extra military areas, in cooperation with State and local health authorities.
(3) Extending the system of collection of reports of disease prevalence.
(4) Protection of the health of industrial workers.
(5) Prevention and control of malaria.
(6) Control of venereal diseases.
(7) Improvement of milk and water supplies, and sewerage.
(8) Supervision of water and ice supplied by interstate carriers.
(9) Control of epidemics.
(10) Prevention of the spread of disease in interstate commerce.
(11) Protection of child life.
(12) Investigations of stream pollution.
(13) Investigations of coastal waters with a view to protecting the oyster beds.
(14) Rural sanitation.
(15) Control of international and interstate quarantine.
(16) Investigations in bio-chemistry.
(17) Supervision of the manufacture and sale in interstate traffic of serums, viruses, toxins and vaccines.
(18) Education in public health matters.
(19) Encouragement of local health administration.

These are matters of large importance and relate to work for which the Public Health Service is peculiarly fitted by training and experience. There can be no more important health work than that which is already being done by the Public Health Service and which will be enlarged as soon as the necessary appropriations are granted by the Congress. If this Service were absorbed by the Army Medical Corps, I should

fear that it would naturally lose its identity in great measure and its functions thereby suffer at the expense of the nation and the Army as well. If its functions and duties were not curtailed, the only accomplishment of the suggested transfer would be a change in direction.

I have gone to some extent in expressing my views about the situation because of the vital importance of the question. I am sure that after a careful consideration of the matter in the light of the facts mentioned above, you will agree with me that there is no reason to consolidate the two services, but, on the contrary, they should continue to perform their respective duties in harmony and close cooperation.

The Public Health Service, under my instructions, is already doing everything possible to cooperate with you and assist the Surgeons General of the Army and Navy, and I have, in fact, permitted transfers of some of the public health officials to these two branches of the Service when they could ill be spared from the important work in which they are engaged.

It should always be borne in mind that the Public Health Service is designed to protect the health of the great civil population of the United States, which is a matter of vast importance; that the work of the Medical Corps of the Army is to protect the health of the Army of the United States. The functions are essentially different—each is indispensable. I should think that what you want to accomplish can be better accomplished through the proper enlargement of the Army Medical Corps and I would suggest that this remedy be adopted. I am sure that the people of the United States would look with apprehension, if not with grave concern, upon any diversion of activities of the Public Health Service and particularly upon anything which would destroy its identity and negate or even minimize the efficiency of the service it is now rendering to the civil population of the United States.

Faithfully yours,

(Signed) W. G. McAdoo
Secretary of the Treasury

Honorable Newton D. Baker
Secretary of War.

Efforts were continued by the Army in certain areas to take over the extra-cantonment sanitation and industrial hygiene activities. A medical officer was assigned by the Army to the United States Shipping Board, a civil organization, to take charge (as a military officer) of the sanitation work of that organization. The Army also requested the Public Health Service to turn over the extra-cantonment work at Newport News, Virginia. Refusal to do this on the part of the Service did not add to the cooperative spirit.

Realizing that a transfer to the military forces was not to be, the Service continued to perform its duties with efficiency in spite of various handicaps. The friction reached such a degree that the President signed an Executive Order confining all civil health activities incident to the war to the Public Health Service.

EXECUTIVE ORDER

Whereas, in order to avoid confusion in policies, duplication of effort, and to bring about more effective results, unity of control in the administration of the Public Health activities of the Federal Government creating in the Treasury Department a Public Health Service, and especially authorizing such Service "to study the diseases of man and the conditions influencing the propagation and spread thereof" and "to cooperate with and aid state and municipal boards of health;"

Now, therefore, I, Woodrow Wilson, President of the United States, by virtue of the authority vested in me as Chief Executive, and by the Act "authorizing the President to coordinate or consolidate executive bureaus, agencies, and offices, and for other purposes, in the interest of economy and the more efficient concentration of the Government," approved May 20, 1918, do hereby order that all sanitary or public health activities carried on by any executive bureau, agency, or office, especially created for or concerned in the prosecution of the existing war, shall be exercised under the supervision and control of the Secretary of the Treasury.

This Order shall not be construed as affecting the jurisdiction exercised under authority of existing law by the Surgeon General of the Army, the Surgeon General of the Navy, and the Provost Marshal General in the performance of health functions which are military in character as distinguished from civil public health duties, or as prohibiting investigations by the Bureau of Labor Statistics of the vocational diseases, shop sanitation and hygiene.

WOODROW WILSON

The White House, 1 July, 1918
(No. 2899)

This Executive Order settled for the time being the province of the Service in these matters. It, however, did not aid the Service in securing personnel, or prevent some of its younger officers from submitting their resignations.

The question of military status not only affected the Public Health Service officers, but also the State, municipal and county health officers. Some were restless and desired to be in the military medical forces; in fact, many gave up their civilian health work to enter the military service. There were many conferences on this subject between these public health leaders and the Service.

The war emergency threw a tremendous amount of responsibility upon the Service. During that period funds appropriated to the Service by Congress increased from about $3,000,000 per annum in 1917 to $50,000,000 in 1918. There was an increase in personnel from about 3,000 to 23,000 employees. The regular commissioned corps of the Service, upon which fell the whole of the supervisory work pending the training of other employees, was not materially increased but remained nearly constant at about 200 officers. Due to war, the principal reason for this condition was the inability to obtain candidates who met Service standards.

Officers Assigned to Navy

Early in the war the Surgeon General of the Navy requested the Public Health Service to assign to the Navy a number of officers to direct and assist in a sanitation program. Accordingly, Drs. Hugh S. Cumming and Carroll Fox were detailed to the office of the Surgeon General of the Navy, and the following officers were assigned to naval districts as sanitation officers:

Dr. Fairfax Irwin
Dr. Louis L. Williams, Sr.
Dr. William J. Pettus
Dr. Gregorio M. Guiteras
Dr. George B. Young
Dr. Mark J. White
Dr. Boliver J. Lloyd
Dr. Arthur M. Stimson
Dr. Frederick C. Smith
Dr. William M. Bryan
Dr. Roscoe R. Spencer

For the duration of the war they were a part of the Navy sanitary organization. The duties of the sanitation officers attached to the several naval districts were to advise with and assist the medical aide in all matters pertaining to public health sanitation. These duties took them constantly into all parts of the naval districts to inform themselves and to keep the commandant of the district and the Bureau of Medicine and Surgery fully informed as to health conditions and sanitation.

The following instructions were given by the Surgeon General of the Navy for the general guidance of these officers:

1. To make regular inspections of the sanitary conditions of naval stations and all places within the naval districts to which they are assigned, with special reference

to water supplies, sewage, garbage, and manure disposal; to the introduction, presence, and disposition of cases of communicable diseases; to the presence of disease-carrying insects or of conditions favoring their growth; to the facilities for messing and housing the personnel.

2. To secure information by personal observation and through civilian health authorities as to the prevalence of communicable diseases and sanitary conditions in the areas around naval stations and in localities from which recruits are collected.

3. To advise and assist in eradicating any communicable disease that may make its appearance in the district, and to make such epidemiological investigations as may be necessary and practicable.

4. To make special effort to secure information as to the quality of water and milk supplied both to naval forces and to the civil populations in the immediate environments of camps and stations, and as to methods of disposal of sewage, etc., in such localities.

5. To direct particular attention to the presence of disease-bearing mosquitoes as well as to mosquito breeding areas either within the camp or within its immediate environment.

6. To determine as far as practicable the prevalence of venereal diseases in the civil communities adjacent to camps and stations, and to enlarge the measures used for their control.

7. To make reports, once a month, and oftener, if necessary, to the Surgeon General (Bureau of Medicine and Surgery) via the medical aide and commandant of the Naval District, giving the results of inspections together with recommendations when necessary, and a summary of work performed during the previous month.

8. In addition to the foregoing, to hold themselves in readiness to perform any unusual duties of this nature which circumstances suggest or which the commandant of the district may deem advisable.

Hospitals Made Available to Army and Navy

The hospital and quarantine stations of the Service were made available for the reception of sick and wounded officers and men of the Army and Navy in accordance with Executive Order dated April 3, 1917.

The Ellis Island Immigration Hospital was taken over and operated by the Medical Department of the United States Army for the period of the war. Much of the bed capacity of the Marine Hospital at Chicago was devoted to providing care for soldiers and sailors in that area.

Extra-Cantonment Sanitation

The experience gained during the Civil and the Spanish American Wars showed that large numbers of men became unfit for service be-

cause of diseases contracted within the areas near the boundaries of the camps.

Thus, to maintain the efficiency of the fighting forces, it was obviously essential to safeguard the health of the soldiers and sailors in the towns and places adjacent to the camps to which they went for recreation and amusement. It was just as necessary to establish and maintain proper sanitary conditions in the extra-cantonment areas as to secure proper sanitary conditions within the camps themselves.

Consequently, upon the declaration of war, plans for the sanitation of extra-cantonment zones were perfected. To carry out this work, there were in the employ of the Service 85 medical officers, 50 sanitary engineers, an average of 100 scientific assistants, 275 sanitary inspectors, 500 foremen, and about 3,000 laborers. As camp sites were designated, the Public Health Service made ready to carry on activities for the prevention of the spread of disease and to protect the health of the military forces outside the camp limits. It was realized that in order to accomplish the best results cordial cooperation must be extended by all health agencies involved. Recognizing that many of the State and local health organizations might not be able to meet the emergency suddenly thrust upon them by the influx of great numbers of military men and industrial workers, State and local health authorities were offered assistance by the Service in either an administrative or an advisory capacity.

Upon the establishment of a camp, Public Health Service officers were detailed for a rapid sanitary survey of the extra-cantonment area to determine the disease problems which were most important, the machinery and funds available to meet the problems, and the additional personnel, facilities and funds necessary to handle the situation. It was not known in advance how many camps were to be established, when or where located, nor what force of sanitary engineers or other trained personnel would be needed, but it was very apparent that as soon as each camp site was approved, the control and preventive measures should be instituted as soon as possible. The first extra-cantonment zone was established about Camp Zachary Taylor, Louisville, Kentucky, in July 1917.

To safeguard properly the health of the armed forces and civilian population it was necessary in many instances to install a complete

health organization; this was done only in those cases in which the local authorities were not able to meet the situation caused by a very greatly increased population. It was the policy of the Service to cooperate to the utmost extent possible with the local agencies and to supply only sufficient personnel to meet the increased emergency conditions. On the whole, the spirit of cooperation on the part of the State and local health authorities was most cordial. Great interest was shown by those officials in having the extra-cantonment zones in their localities in the best possible condition for the protection of the inhabitants as well as for safeguarding the health of the armed forces. In some instances individual States felt that their own organizations were able to meet the increased needs occasioned by the sudden rise in population and no assistance from the Service was requested. However, it was found that the health machinery in some zones was wholly inadequate to meet the increased demands suddenly imposed. The additional assistance necessary was furnished by the Public Health Service. In all the extra-cantonment zones where the Service exercised supervision or control, the officer in charge was clothed with State and local health authority in order to enforce properly the necessary regulations pertaining to general sanitation. The aim in each area was to strengthen the health organization by supplying the necessary expert supervision, or in those cases where no organization was present, to supply an organization sufficient to meet the needs of the local situation.

In the beginning of the war there were no Federal funds available for supplying additional personnel; the American Red Cross, in order to cooperate, created a Bureau of Sanitary Service with Dr. Taliaferro Clark of the Public Health Service as Director. Through an allotment of Red Cross funds this bureau undertook the sanitation of the extra-cantonment zones following a plan advanced by Doctor Clark and Surgeon General Blue for the establishment and maintenance of Red Cross Sanitary Units. Each Unit consisted of a Director, the Public Health Service officer in charge of the extra-cantonment zone, and public health nurses, sanitary inspectors, and laboratory technicians supplied by the Red Cross.

A Medical Advisory Committee of the American Red Cross was established in 1917. The membership of this Advisory Committee was:

Dr. Simon Flexner, Chairman, New York
Dr. William H. Welch, Baltimore
Dr. Frank Billings, Chicago
Dr. Victor C. Vaughan, Ann Arbor
Colonel Jefferson R. Kean, U. S. Army
Lieut. Com. William E. Eaton, U. S. Navy
Dr. John W. Kerr, Public Health Service
Dr. Richard M. Pearce, Washington, D. C.
Dr. Herman M. Biggs, New York, New York
Dr. Charles V. Chapin, Providence, Rhode Island
Dr. Alfred E. Shipley, New York, New York
Dr. Wyckliffe Rose, New York, New York
Dr. Walter C. Bailey, Boston, Massachusetts
Dr. Milton J. Rosenau, Boston, Massachusetts
Dr. Richard P. Strong, Boston, Massachusetts

Funds were also available from the Red Cross for transportation and supplies necessary for the operation of the Red Cross sanitary units.

SANITATION FUNDS PROVIDED BY CONGRESS

Without such timely assistance, extra-cantonment zone work would have been greatly hampered and could not have been instituted on an extensive scale until after the passage by the Congress of Public Act No. 181 of the 65th Congress approved July 1, 1918, which provided:

Interstate quarantine service: For cooperation with State and Municipal health authorities in the prevention of the spread of contagious and infectious diseases in interstate traffic, including the sanitation of areas adjoining military and naval reservations and Government industrial plants, in order to safeguard properly the health of the military forces and Government employees, $1,000,000.

It was realized that to protect and safeguard properly the health of the military forces and the local population the scope of activities must be very broad and cover many phases of work if disease hazards were to be reduced to a minimum. Consequently, emphasis in 51 extra-cantonment areas was directed toward the following lines of endeavor:

Control of communicable diseases.
Mosquito control and antimalaria work.
Venereal disease control.
Epidemiological work.
Morbidity and mortality reporting.

Distribution of serum, vaccine, and related products.
School inspection.
Laboratory work.
Public health nursing.
Food, drink, and restaurant supervision.
Supervision of milk supplies.
Supervision of water supplies.
General sanitation:
  Sewage disposal.
  Garbage and waste disposal.
  Fly control.
Public health education.

Acts approved March 28, 1918, July 1, 1918, and November 4, 1918, appropriated $2,000,000 to the Public Health Service —

> . . . for the control of malaria, cerebrospinal meningitis, and other communicable diseases in the areas adjoining military and naval reservations, and for sanitation of areas adjoining military and naval reservations and Government industrial plants in order to properly safeguard the health of the military forces.

In March 1918 Dr. Allan J. McLaughlin was recalled from Massachusetts where he had served for four years as State Health Officer to become Assistant Surgeon General in charge of the Division of Domestic Quarantine. This Division was responsible for the administration of the extra-cantonment zone sanitation, including venereal disease control activities. Much of Doctor McLaughlin's time and experience went into the plan of the Public Health Service in World War I for the extra-cantonment and public health activities.

Sanitation was under the control of the military authorities within the camp boundaries and it was comparatively easy to accomplish proper sanitary conditions and to establish the necessary sanitary safeguards within an area which was exclusively under military control. But to secure a like measure of protection under civil authority in areas surrounding the camps proved to be a complex problem and one much more difficult of solution. This duty of protecting the health of the military forces in areas contiguous to the camps was successfully performed by the Public Health Service.

Intensive control operations to combat malaria were carried on in a radius of one mile surrounding cantonments, naval reservations, aviation

camps, munitions plants, shipyards, and other important war industries. The work consisted of the drainage of swamps, ponds, wet areas, and seepage outcrops; the proper clearing and regrading of natural water courses; the application of oil to remaining mosquito-breeding areas; and the modification of shore lines and shallow parts of large lakes and ponds.

A total area of 1,227 square miles was under supervision giving protection to an average total of 1,140,800 military men at all times, as well as to a total of 3,757,848 of the civilian population.

The results accomplished in antimalarial work, covering 40 areas in 15 States, certainly made the malaria hazard one of no serious consequence to the military authorities.

The establishment of the camps was followed by a consequent increase in the population of the areas adjacent to the camps and there was naturally a demand for a great many more food and drink establishments. Included among numerous new food and drink places were many mushroomlike establishments, located near the borders of the camps. These were of primitive construction with few facilities and no regard for cleanliness. A system of inspection and certification of these business places was inaugurated in practically all of the extra-cantonment zones as the result of an order issued by the Surgeon General of the Army under date of December 3, 1917, directing officers in command of the different camps to cooperate in every way possible with officers of the Public Health Service who were charged with the sanitation of extra-cantonment zones. Orders were usually issued by the commanding officer forbidding men in uniform to patronize a place not certified by the Public Health Service. Where necessary the order was enforced by placing military police on guard near places not certified in order to prevent soldiers from patronizing them.

SUPERVISION OF MILK, WATER, AND SEWAGE DISPOSAL

It was necessary to exercise rigid supervision over the milk supply of the extra-cantonment areas. Unless properly safeguarded, milk is a common medium for the spread of acute infectious diseases. During World War I, throughout the South, milk in given areas was generally supplied by local producers and dealers, very rarely from a distance

greater than 75 miles. The passage and enforcement of ordinances governing the processing and sale of milk and milk products resulted in marked improvement in milk supplies in several areas.

The importance of pasteurization properly conducted and supervised was emphasized to producers and handlers of milk. A number of new pasteurizing plants were established and existing ones were remodeled or enlarged.

In a number of the extra-cantonment zones frequent requests were received by the Service from local officials to supervise their water supplies, because the superintendents, engineers, and other personnel had entered the military service. This was especially important and compatible with Service activities because most of the cities in which extra-cantonment zones headquarters were located also furnished the water supplies for camps adjacent to the city.

In the different extra-cantonment zones all varieties of sources of water were encountered, some of the zones having deep wells, some flowing artesian wells, some creek or river water, and others impounding reservoirs.

To insure adequate safeguards the inspection and supervision of sewage disposal methods in extra-cantonment areas were necessary. In those cases where supervision was lacking, trained personnel for this phase of the work was supplied by the Service. Each extra-cantonment zone was divided into urban and rural areas. Surveys were made to determine the existing conditions, including data on the number of homes with sewers and those not having sewers. The general policy of the Service was to encourage the enforcement of existing ordinances and to insist upon the passage of ordinances requiring owners of homes outside of sewered areas to be compelled to install acceptable sanitary privies.

RURAL AREAS

In the rural areas surrounding the camps initial surveys showed conditions to be very primitive in many instances. It was finally decided that the most satisfactory type of privy to be installed was the double compartment concrete vault. These vaults were installed under a cooperative plan, the county or rural district supplying half the funds for

the supervision and labor and the Service the other half, the individual for whom the work was done supplying the necessary materials for the construction of the vault. As a result of these activities, double compartment concrete privy vaults were installed at practically every home within the five-mile zone surrounding a great many of the camps.

PUBLIC HEALTH NURSING

A very important phase of extra-cantonment sanitation and one which did a great deal for the prevention and control of disease was public health nursing. In the beginning all nurses were detailed to the directors of sanitary units by the American Red Cross, but subsequently this number was increased by the Service employing many local nurses. A further augmentation of nursing personnel and services was brought about by the coordination of all nursing agencies within the individual area in order that greater efficiency might be obtained and to prevent duplication of effort. This system, where established, proved to be very efficacious as there was one directing head instead of a head for each previously existing unit.

The duty of the public health nurse was to investigate all cases of communicable diseases, to instruct members of the household in the proper care of patients in order to prevent the spread of the disease to other members of the family, to give instructions in the proper methods of nursing, disposition of human wastes, the use of disinfectants, and the like. The total number of visits made by nurses in 37 zones was 201,577.

CEREBROSPINAL MENINGITIS

Outbreaks of cerebrospinal meningitis occurring in November and December 1917, in camps and extra-cantonment zones were investigated by officers trained in methods of laboratory diagnosis. At Norfolk, Virginia, the epidemic showed a fatality rate of over 50 percent. At Charlotte, North Carolina, and Alexandria, Louisiana, the first cases appeared in those camps during that period. Other epidemics occurred in South Carolina, San Antonio, Texas, at Newport News, Virginia, and Great Lakes Training Station, Chicago, Illinois.

HEALTH EDUCATION

In extra-cantonment zone sanitation great stress was put upon public information. Lectures were given on health subjects illustrated by slides and motion pictures. Hearty cooperation was usually extended by the local newspapers in giving publicity to the work, what it meant for the community, and the results accomplished. Thousands of pamphlets and bulletins on subjects pertaining to health and sanitation were distributed and everything possible was done to keep before the minds of the public in those areas the importance of an active, alert, and modern health department.

INDUSTRIAL PLANTS

Under authority of the Executive Order of July 1, 1918, the Public Health Service took over the sanitation of the 170 shipyards of the Emergency Fleet Corporation. This work was under the general direction of Dr. Leslie L. Lumsden.

Upon request of the Secretary of War, the Public Health Service took over the sanitation and the medical and surgical work in the United States Explosive Plant C at Nitro, West Virginia. This function involved the care of approximately 35,000 persons and required the services of 35 medical officers, 80 nurses, and numerous other persons, making a total of about 600 individuals engaged in the health and medical care of that unit.

In order to assist in preventing the spread of smallpox and typhoid fever among war workers, the Service advised all persons in charge of establishments manufacturing war materials to require all employees to be vaccinated against smallpox and inoculated against typhoid fever.

Studies were also made in 170 industrial establishments of the medical and surgical facilities for the care of workers engaged in manufacturing materials relating to the war effort. In cooperation with the Ordnance Department of the Army, officers of the Service conducted examinations as to the hygienic conditions in 30 plants manufacturing TNT, picric acid, and other chemicals, and of persons engaged in loading shells and hand grenades and handling poison gases. Reports were furnished to the Ordnance Department which saw to the enforcement of the recommendations made as a result of the Service investigations.

SUMMARY

The protection of the health of the military, naval and industrial forces and of the general population was the aim of the extra-cantonment sanitation program. A by-product was to assist in building up local health organizations and to demonstrate the advantages to be derived from a full-time and efficient health organization. This was without doubt, up to that date, the greatest public health demonstration that the United States had seen, and showed clearly the advantages to be derived from a well-organized and fully equipped health department. When the Service activities were concluded, approximately one-half of the local health agencies involved retained their full-time organization.

After the war, many States obtained legislation for the reorganization of their health departments and many communities retained the organizations which had been established during the war. Special programs such as malaria control and venereal disease control became permanent activities in a number of State health departments.

Prevention of Venereal Diseases

The first definite work of the Public Health Service for controlling venereal diseases during World War I was in the various extra-cantonment area clinics placed in operation in December 1917. The next step in the development of a nationwide control program was the sending of a telegram, letter, and memorandum by Surgeon General Blue on January 2, 1918, to each State health officer inviting attention to the fact that the control of venereal infections was an important sanitary problem in connection with the prosecution of the war. In these communications the States were urged to consider a plan of control submitted by the Service including a requirement that venereal infections be made reportable, and emphasizing what means of diagnosis and treatment should be provided.

This action on the part of the Service received a hearty and universal response, and encouraged the preparation of suggestions for regulations for use of State health departments in the control and prevention of venereal diseases. A proposed uniform method of handling venereal

diseases was developed at conferences between the Surgeons General of the Army, Navy, and Public Health Service with a number of State health officers, as well as other interested and well-informed persons. These suggestions made to the various State health departments closely followed the State-wide plan for venereal disease prevention introduced in Massachusetts by Dr. Allan J. McLaughlin of the Service who, at that time, was serving as State Commissioner of Health.

Later, the Public Health Service offered to appoint a person in each State to assume charge of the venereal disease control program under the direction of the State health department, the individual assigned to be subject to the approval of the State health officer. A large number of acceptances were received from State health departments, as well as many inquiries for further details.

DIVISION OF VENEREAL DISEASES ESTABLISHED

The Army appropriation Act approved July 9, 1918, created in the Public Health Service a Division of Venereal Diseases and appropriated $2,000,000 to the Service for the prevention, control, and treatment of venereal diseases. Dr. Claude C. Pierce was placed in charge of this newly established Division.

This sum was to be allotted to, and expended by, the various States, each State's share being based upon the ratio of its population to that of the United States but conditioned upon the appropriation of an equal amount by the State itself.

The duties of the newly created Division of Venereal Disease were: (1) to study and investigate the cause, treatment, and prevention of venereal diseases under rules and regulations prescribed by the Secretary of the Treasury; (2) to cooperate with State boards or departments of health for the prevention and control of such diseases within the States; (3) to control and prevent the spread of these diseases in interstate traffic.

For the administration of the Division of Venereal Diseases the sum of $200,000 was appropriated for the fiscal year ended June 30, 1919. The sum of $1,000,000 was appropriated annually for two years to be allotted to the State health departments for their respective use in the prevention, control, and treatment of venereal diseases. The allot-

ment to each State was made in accordance with the population proportion formula. Except for the fiscal year ended June 30, 1919, the allotment to any State depended upon the appropriation of an equal amount by the State for the prevention, control, and treatment of venereal diseases.

The Act establishing the Division of Venereal Diseases in the Public Health Service also created an Interdepartmental Social Hygiene Board consisting of the Secretaries of War, Navy, and Treasury as ex-officio members, and the Surgeons General of the Army, Navy, and Public Health Service or representatives approved by the respective Secretaries. The duties of this Board were to recommend rules and regulations for the expenditure of money allotted to the States to assist them in conducting the program for the control of venereal disease. Their duties also included the selection of certain universities or other suitable institutions or organizations to which funds could be allotted for the purpose of discovering more effective medical means in the prevention and treatment of these diseases and for the purpose of developing more effective educational measures.

All of the States, with the exception of the District of Columbia, Nevada, and Pennsylvania, made provisions for the control of venereal infections as a part of the work of the State health department. In May 1919, 34 States reported that 202 clinics had been organized for the treatment of venereal diseases. In addition to these 202 clinics, the Public Health Service and the American Red Cross were operating clinics for the treatment of these diseases in 25 extra-cantonment zones, thus making a total of 227 such clinics in operation on June 30, 1919. Detailed information furnished by 154 of these clinics showed that during the fiscal year 1919, 56,508 persons having venereal diseases were treated.

Grant-in-aid to States for venereal disease control became available through an appropriation of $1,000,000 for the fiscal year 1920. The following year, 1921, this was cut to $500,000 and in 1922 no provision for grant-in-aid to States was made. From 1923 to 1925 a small fund of $225,000 was made available each year for cooperative activities in the control of venereal diseases.

An important phase of the venereal disease program developed by the Service was the extensive educational program carried out in cooperation with State health departments. This educational program was regarded as necessary because of the fact that venereal infections had not theretofore been given proper publicity. To initiate this program, 50 separate educational pamphlets referred to as venereal disease bulletins were prepared for use, as well as a motion picture film titled "Fit to Fight" later changed to "Fit to Win." State health departments were urged to amplify the educational program for the control of venereal diseases. By 1920, every State except Nevada and the District of Columbia required the reporting of venereal diseases.

The following is an interesting commentary on the reaction to an early attempt by the Public Health Service to bring these diseases out from their protective shadow of a false prudery and attack them in the clear light of publicity.

In 1908 Dr. Claude H. Lavinder was instructed by Surgeon General Wyman to prepare a simple pamphlet on venereal diseases for distribution to persons coming for treatment to the Marine Hospitals and outpatient dispensaries. The manuscript of this proposed pamphlet was carefully edited by a board of officers including Doctor Lavinder and later reviewed by Surgeon General Wyman. The publication of this pamphlet was refused by the Assistant Secretary of the Treasury on the ground that such literature was not sufficiently dignified to bear the imprint of the Treasury Department. The public health aspects of venereal disease were emphasized by World War I. A vigorous program against venereal diseases resulted. Significant contributions to its progress have come from Service officers, notably Drs. Thomas Parran, John F. Mahoney, Raymond A. Vonderlehr and J. Rodney Heller.

The Hygienic Laboratory and World War I

With the outbreak of hostilities in Europe in 1914, contracts were placed by the allies with the American manufacturers for large quantities of biologic products, particularly tetanus antitoxin. It was foreseen that under the stress of quick deliveries, inferior products might find their way into the market. An especially close watch was therefore

kept on biologic remedies intended for export. It was realized that the use of an inert or contaminated product might result in much illness and possibly many deaths among the troops. In one instance the close supervision insisted upon by the Hygienic Laboratory prevented the shipment to the allied authorities of a large consignment of contaminated tetanus antitoxin. Had this consignment been released, it would have resulted in the loss of prestige enjoyed by the American manufacturers of biologics, to say nothing of the possible loss of life.

As it appeared that antityphoid vaccine would be used in large quantities, work upon its standardization was completed in January 1917. Manufacturers of that vaccine, as well as Government agencies, were accordingly in position to supply a standard product to the military forces and to physicians upon short notice.

As the sanitation of the extra-cantonment zones was under the direction of the Public Health Service, the Hygienic Laboratory was called upon to supply antityphoid vaccine. Over one million cubic centimeters of antityphoid vaccine were made and distributed in the two years from July 1, 1917, to June 30, 1919. Most of the vaccine was shipped in large quantities to the extra-cantonment zones where it was administered, by or under the supervision of, Public Health Service officers. This vaccine consisted of single typhoid and triple vaccine (typhoid-paratyphoid A and B), the latter type being most generally used.

In 1917 the standardization of antipneumococcic, antidysenteric, and antimeningococcic serums was undertaken. Though this was not done strictly as a war measure, the outbreak of the war caused this phase of the work to be carried forward. Early in 1917 evidence came to hand which indicated that an antitoxin against the organisms causing gas gangrene was needed. In June a conference was held with manufacturers and with representatives of the Medical Department of the Army, at which arrangements were made looking toward the production, testing, and standardization of such a product.

The occurrence of several cases of tetanus which, epidemiologically, were associated in a suspicious manner with vaccine virus dispensed on the "ivory" points of a single manufacturer, led to the recommendation for a study of the use of such points with smallpox vaccine virus. A

rather extensive investigation showed that the points, as they reached the manufacturer, were frequently contaminated with tetanus spores and, where disinfection measures were inadequate, the contamination might be carried through to the finished product. A standardized technique of testing vaccine for anaerobic contaminations was evolved by the Hygienic Laboratory. This method was required to be employed by all the manufacturers.

Arsenicals

Up until 1919 it was thought that the arsenicals used in the treatment of syphilis had no status as biologic products under the Act of July 1, 1902. On June 13, 1919, however, the Solicitor of the Treasury issued an opinion that arsphenamine "is included as one of the products the manufacture and sale of which is placed under the control of the Treasury Department." Following the declaration of war in Europe in 1914, the importation of antisyphilic arsenicals soon reached such a low point that it became necessary for American manufacturers to make the products themselves. Through efforts of the Public Health Service the Federal Trade Commission abrogated foreign patents for the manufacture of salvarsan and novocain. As a result salvarsan was manufactured by American firms. The State of Massachusetts under the leadership of Dr. Allan J. McLaughlin, then State health officer, was the first agency to make salvarsan available. Because of the interstate shipment of such products it became evident that laboratory control should be exercised by the Government over their preparation and distribution. The situation created by the shortage of salvarsan was happily improved shortly after the United States entered the conflict.

Control of the manufacture of arsphenamine was made possible through studies conducted at the Hygienic Laboratory for the purpose of discovering a satisfactory method for the toxicological and chemical standardization of the drug. These studies, commenced in 1916, were brought to a successful conclusion in 1917.

Anthrax

In the early stages of the war a number of cases of anthrax associated with shaving were reported to the Hygienic Laboratory. Circumstances

pointed strongly to the use of new shaving brushes as the source of infection, and popular suspicion in those distressing times pictured the trouble as the work of enemy agents. In order to trace the matter, brushes used by shavers who had become infected were obtained whenever possible and bacteriological examinations made for the presence of anthrax. In almost every instance anthrax spores were obtained from the suspected shaving brushes, and it was noted that infection followed the use of horse hair brushes only. This led to a survey of the shaving brush industry. The fact was developed that most of the horse hair entering into the manufacture of shaving brushes was imported from the Orient, where anthrax is endemic and that the infected hair inadequately sterilized had gone into the manufacture of these brushes. Conferences with shaving brush manufacturers were held. As a result, regulations governing the production of shaving brushes, from the standpoint of preventing anthrax infection, were recommended and adopted.

Germs for War

It was the custom for many years for institutions, especially the Hygienic Laboratory, to supply cultures of pathogenic organisms to other institutions and individual workers in the general interest of scientific progress. Impressed with the need of taking every precaution in wartime to prevent the improper use of virulent pathogenic organisms which might fall into the hands of ill-intentioned persons, steps were taken to obviate this possibility. Letters covering this point were sent out by the Public Health Service to the laboratories of State and local health departments, to medical schools, and establishments manufacturing biologic products. Similar communications were sent by the Bureau of Animal Industry of the Department of Agriculture to university laboratories, agricultural colleges, and to other institutions whose work was related to that of the Department of Agriculture. The result was that before a request for a pathogenic culture was honored, it had to be certified by a duly constituted authority, usually a State health department.

Only one well-defined case of an attempt to secure a culture for illicit use came to the attention of the Hygienic Laboratory during the

entire period of the war. A man called one day and asked for a culture of *Bacillus botulinus* with a plausible excuse for his request. Lacking proper credentials, his request was denied. A day or two later, a Federal intelligence officer appeared at the laboratory for information concerning the man who was being sought as an enemy agent.

One of the interesting phases of the participation of the Hygienic Laboratory in the effort during World War I related to the examination of specimens suspected of being contaminated by enemy agents. In the early days of the war, the feeling was quite general that the whole land was infested with spies who plied their trade not only by propaganda and the destruction of munitions but by poisoning food and inoculating food supplies with disease-producing organisms. The result was bombardment of the intelligence services of the Federal Government with reports of food contaminations. Taking no chances, the government operatives seized all kinds of suspected material and forwarded or brought the specimens to the Hygienic Laboratory for examination. These covered almost every imaginable article—cakes, candies, confections, preserves, flour, breakfast food, clothing, court plaster, soap, bandages, chewing gum, and the like. In every case these specimens were given careful examination which, with two exceptions, gave negative results.

In one instance, an intelligence officer brought in five packages of a popular brand of breakfast food, four of the packages unopened, the other opened, with the statement that they were suspected of containing powdered glass. The contents of the opened package were passed through a fine mesh screen and a number of glass particles were found. Examination of the unopened packages revealed no glass. An investigation by intelligence officers disclosed the fact that a personal enemy of the merchant had "planted" powdered glass in the food for the purpose of getting him into trouble.

The other case was tetanus spores in court plaster. Street peddlers of notions were as busy in gaining a livelihood during World War I as at any other time. Many of them handled court plaster. Bacteriological tests of a large number of samples of court plaster sent in for examination revealed the presence of tetanus spores in several specimens; how-

ever, examination of samples secured from responsible sources likewise showed the presence of tetanus spores in a few cases. After considerable investigation, it was concluded that tetanus spores might gain access to open wounds through the presence of tetanus spores in the glue of court plaster because of defective sterilization at the time of manufacture. As in the case of anthrax in shaving brushes, the condition corrected itself. In no case was the presence of tetanus spores in court plaster traced to malice.

On one occasion an alleged spy was brought to the Hygienic Laboratory under guard and spent several days there in an attempt to reveal the secret of some of the gases used by the enemy in its chemical warfare. The man freely admitted that he was a spy which created a rather interesting situation to the three persons connected with the laboratory who knew the object of the man's presence. Apparatus and materials were placed at his disposal, and a trained chemist of the laboratory personally observed the "demonstrations." That the man was a chemist was beyond question; yet he made no progress. This raised suspicions as to his sincerity in betraying his government. The Hygienic Laboratory at that time was located adjacent to the Naval Hospital. The alleged spy was quartered at the Naval Hospital where, by good fortune, a Navy psychiatrist had an opportunity to observe him. The outcome was unexpected though not surprising. The man was insane and was later sent to an institution for mental patients.

Influenza Epidemic of 1918

During the summer of 1918 reports appeared in the newspapers from time to time showing the great prevalence of the so-called Spanish influenza in foreign countries. This disease was reported to the Public Health Service from Switzerland, France, Great Britain, and elsewhere. The Service realized that the United States would be affected by the epidemic and that it was impossible to prevent the entrance of influenza because of the world-wide distribution of the disease.

Of interest are the early stages of the world-wide influenza epidemic viewed by medical officers of the Service who were attached to Coast Guard vessels that were based on Gibraltar performing convoy escort

duty up the coast of Spain and across the Bay of Biscay to England. They observed the beginning of the epidemic in Spain and its progress to England and France. They saw practically all of the ships of the entire British-American-Italian fleet tied up at one time or another in the harbor of Gibraltar with many crew members ill of influenza. They saw countless funerals pass through the streets of Gibraltar. Later, they saw the epidemic strike England and France, and still later, they returned to the United States in time to see it appear here.

They found that in the case of the crews of their vessels the most effective measures were to take temperatures of the entire ship's company twice a day, and to place at bed rest everyone who had even a fraction of a degree of rise of temperature, and to keep them at rest until they were free of fever for a full day.

Medical officers in charge of quarantine stations of the Public Health Service were cautioned to be on the alert in the inspection of crews, passengers, and vessels from European ports so that cases of the disease could be brought to the attention of local health authorities. This also would serve as an index to the number of cases entering this country through maritime channels. The instructions to the quarantine officers emphasized the fact that cases of minor respiratory infections were not to be considered, and that the local health authorities should be advised only about those infections involving a considerable number of the crew or passengers, and which were highly communicable and suggestive of epidemic influenza.

Early in September it was reported that influenza was present in New England to a certain extent. On September 18, 1918, telegrams were sent by Surgeon General Rupert Blue to all State health officers requesting information concerning the prevalence of the disease in their respective States. Replies to this request showed that epidemic influenza was present in New England and along the Atlantic coast to the Virginia Capes, and that in addition, there were a few foci in the States east of the Mississippi River.

On September 26 the State health officer of Massachusetts requested aid from the Public Health Service as the disease was spreading very rapidly over the entire State and he was unable to furnish physicians and

nurses to the stricken communities. A number of medical officers were sent immediately to Massachusetts for duty in cooperation with the State health authorities.

There was a great shortage of both physicians and nurses throughout the country, as many physicians and nurses were already in the military service. Obviously, with its limited personnel the Public Health Service could not furnish the medical assistance necessary. There was no appropriation available whereby physicians and nurses could be employed to assist the States. The Congress immediately passed the following resolution in an endeavor to meet the situation.

(Public Resolution No. 42—65th Congress)
(H. J. Res. 333)

Joint resolution to aid in combating "Spanish influenza" and other communicable diseases.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That to enable the Public Health Service to combat and suppress "Spanish influenza" and other communicable diseases by aiding State and local boards of health or otherwise, including pay and allowances of medical and sanitary personnel, medical and hospital supplies, printing, clerical services, and rent in the District of Columbia and elsewhere, transportation, freight, and such other expenses as may be necessary there is appropriated, out of any money in the Treasury not otherwise appropriated, $1,000,000 to be available until June 30, 1919.

Sec. 2. That the Secretary of War, the Secretary of the Navy, and the Secretary of the Treasury are authorized and directed, respectively, to utilize jointly the personnel and facilities of the Medical Department of the Army, the Medical Department of the Navy, and the Public Health Service, so far as possible, in aiding to combat and suppress the said diseases.

Approved October 1, 1918.

The funds being provided, it then became a question as to where the personnel could be found. Appeals were made to the American Medical Association and the Volunteer Medical Service Corps. These organizations immediately furnished lists of physicians from the various States who might be secured for influenza duty. The Journal of the American Medical Association, through its columns, appealed to the profession to apply for duty with the Service in combating the epidemic.

The problem of securing nursing personnel was more difficult. The nursing division of the American Red Cross asked that the Public Health Service not attempt to recruit nurses as they were endeavoring to supply the needs of the Army and Navy. The American Red Cross, however, agreed to supply nurses to the Service for influenza work in so far as possible.

It was impossible generally to provide enough physicians and nurses to treat individuals. This was done in some instances and all personnel worked unceasingly in treating the patients. Probably the most important accomplishment was organization of the local resources in advance of the height of the epidemic. Plans were made for opening emergency hospitals as needed, volunteer nurses were organized, emergency kitchens were established, and in this way many communities were able to take care of themselves when the epidemic reached them.

Calls for assistance increased daily from all sections of the country. It was decided, therefore, to appoint a director for each State. In many instances the State health officer accepted appointment as field director and as such directed the movements of Service personnel within his State. In other instances an officer of the Service was detailed to the State to cooperate with the State health officer in directing relief. These officers were placed on duty in the various States on October 15, 1918. All requests for aid were made direct to the officer in charge of the project in the State. In this way he was able to judge the merits of the different requests and to distribute his personnel for best results.

Each State made daily telegraphic reports of the progress of the epidemic and the need for aid. In this way the Public Health Service was able to maintain an over-all picture of the situation and could determine where personnel could be sent to be of the greatest use.

During the influenza epidemic 64 commissioned officers, approximately one-third of the Corps, were assigned to full-time influenza duty. Between October 1, 1918, and June 30, 1919, the Service employed 1,085 additional physicians, 703 nurses and nurses' aides, and 328 clerks to deal with the epidemic. Many of these epidemic workers moved from State to State serving in as many as three areas.

By December 1, 1918, the epidemic had reached the peak and had begun to subside. The second wave in the spring of 1919 did not reach

that first high-water mark. Even after the worst was over, requests for help came from many parts of the country. Numerous communities had no physicians or nurses, or too few, or were loath to part with personnel assigned to them by the Service for epidemic duty. By February 15, 1919, the $1,000,000 appropriated by the Congress was exhausted and little or no Federal aid was available to the communities during the second wave of the epidemic.

The paper work involved in governmental transactions is always confusing to those not familiar with the routine. The problem of paying physicians and nurses for their services during the influenza epidemic proved to be a long and complicated process. The Public Health Service did not have sufficient clerical staff to handle the details of such a task, although the Headquarters staff had been increased substantially. It was impossible to obtain additional personnel trained in Government procedures, for there were few such persons to be secured in Washington. The epidemic had struck the National Capital early in September, and many trained workers of the Service were ill with the disease. Then, too, the Service had to select and appoint practically all of the emergency professional staff by telegram, with consequent confusion and inaccuracies as to dates of employment and amounts due.

The disbursement and accounting for the $1,000,000 available for the influenza epidemic was a difficult task. The amounts of the disbursements ranged from $1.00 to $5,000. There were justifiable complaints of physicians and nurses who had left their private work to serve in an emergency. They could not understand what seemed to them to be very circuitous processes to receive pay for their services from the Government. Eventually, the vouchers were processed and final payments made.

Had there been a reserve corps for the Service, as had been advocated early in the war, the work of assisting the States during the outbreak of influenza would have been far easier and would have been more efficiently handled. After influenza became epidemic the resolution to establish the Reserve Corps, having already been passed by the Senate, was favorably acted upon by the House. This authorization for a reserve officer corps came too late to be of any value during the influenza outbreak of 1918.

There were reported 4,114,810 cases of influenza and pneumonia in the United States in October, November, and December 1918. During the same period the deaths from influenza and pneumonia reported in the registration area in the United States were 376,696. The total number of deaths in the United States due to influenza during this epidemic was estimated to be more than 500,000.

Through the cooperation of the Service with the State health authorities a great deal of good was accomplished during the influenza epidemic. Aid was supplied where it would have been impossible to do so otherwise, and in many instances the States did not have funds that could be used for influenza; legislatures were not in session, and funds could not be obtained. Undoubtedly many lives were saved, and much suffering was avoided by the combined and coordinated efforts of the State and local health authorities, the American Red Cross, members of the Volunteer Medical Service Corps, and the Public Health Service.

This was the most devastating, widespread epidemic of modern times. Pandemics of influenza are known to have occurred in 1836, 1847, and 1889. The 1918 pandemic occurred at a time when many physicians and nurses were absent on duty with the armed forces. This is an example of one of many public health emergencies among the civil population that could cripple a war effort, and gives warning of the necessity for over-all planning in anticipation of war attended by enemy invasion, atomic or bacteriologic warfare attacks.

Medical and Surgical Care for World War I Veterans

The sudden termination of hostilities during World War I found the United States with no perfected plans of demobilization. Quite as suddenly in 1919 the Public Health Service found itself charged with the large responsibility of furnishing medical and hospital care to sick and disabled veterans of World War I under an Act of Congress approved March 3, 1919.

In order to understand the position of the Public Health Service in this important work, it is necessary that the legal status of the Service in relation to this responsibility be stated. In the enactment of legislation for the general care of disabled veterans, Congress contemplated

measures very different from the pension system then in operation for veterans of preceding wars. Congress had in mind a broad, constructive program whereby a disabled man discharged from the military forces would, in effect, receive compensation for his disability, medical care and treatment to the point where he would receive maximum benefit and, finally, in the case of residual disability, the necessary vocational re-education to fit him for some gainful occupation whereby he might be enabled to earn as good a living as he had before. The plans, therefore, of caring for disabled veterans included three major activities—the rating of disability and the payment of compensation, medical care and treatment, and vocational re-education where necessary.

The legislation as enacted by Congress did not create any single new agency to discharge all of these functions, but made use of existing agencies of the Federal Government by charging them with additional responsibility. The central agency in the performance of this important work was the newly created Bureau of War Risk Insurance and, under the terms of the Act (with amendments) creating this Bureau it seems obvious that Congress intended the main responsibility for all of these functions to fall upon that Bureau. Both the Bureau of War Risk Insurance and the Public Health Service were in the Treasury Department. The Bureau of War Risk Insurance was given broad powers in relation to the general care of disabled veterans. That Bureau, however, was without medical and vocational agencies; therefore, the two functions of furnishing medical care and treatment and of vocational re-education were placed respectively upon the Public Health Service and the Federal Board for Vocational Education, an independent governmental organization not attached to any Department.

So far as the Public Health Service is concerned, under the terms of the Act of March 3, 1919, quoted above, it was authorized to furnish medical care and treatment to disabled veterans of World War I. In reality, as will be seen later, this function was to be performed as an agency of the War Risk Insurance Bureau. This rather peculiar legal status is worthy of comment because it placed the Public Health Service in an untenable situation in the performance of an immediate, difficult and monumental task.

Since the Chief of the War Risk Insurance Bureau under the law had full authority to use not only the Public Health Service but also the medical departments of the Army and the Navy, and even civilian agencies, it left the whole situation indefinite with too much dependence under the circumstances upon the will of one individual. And, as circumstances later demonstrated, it did not permit the establishment on the part of the Public Health Service of definite policies with an assured outlook as to the future. This, of necessity, militated against the formation of a permanent organization and interfered with development necessary to meet the needs of a situation which in reality constituted a national emergency.

The execution of this legislation required the closest possible cooperation on the part of three distinct agencies of the Federal Government. All of these agencies were under different administrative heads and worked under laws indefinite in many respects and by no means entirely harmonious, and required on the part of each an immense amount of labor later in making the administrative adjustments necessary under such conditions. This cumbersome arrangement subjected the whole program and the Federal Government to a great deal of criticism.

For the Public Health Service, this new responsibility meant that the creation of an organization and the furnishing of all necessary medical facilities had to be done under great stress, while at the same time medical service had to be delivered promptly to men demobilized and scattered throughout the United States and in some foreign countries. While the Service had the basis upon which to expand, it was evident that to meet this very large and new responsibility, its expansion would have to be not only tremendous in its scope, but accomplished with great promptness to meet the emergency. After preliminary adjustments with the War Risk Insurance Bureau and the designation by that Bureau of the Public Health Service as the principal agency for furnishing medical care and treatment to veterans, the Service began in March 1919, in accordance with legislative authority and funds appropriated, the expansion necessary to meet this new responsibility.

TREMENDOUS BURDEN PLACED ON SERVICE

While the Act approved March 3, 1919, authorized the Public Health Service

. . . to provide immediate additional hospital and sanatorium facilities for the care and treatment of discharged, sick, and disabled soldiers, sailors, and marines, Army and Navy nurses (male and female), and patients of the War Risk Insurance Bureau,

and appropriated a limited sum of money, about ten million dollars, to acquire certain facilities and put the law into effect, it made no provision for the construction of hospitals on any commensurate scale.

Provision was made, however, for limited construction, the purchase of existing plants, the release to the Public Health Service by other government agencies of certain temporary hospitals used during the war, authority to take over leases which had been made by the Army for war purposes, as well as to lease suitable buildings and convert them to hospital purposes. Provision was also made for transfer from the War and other departments of such facilities as could be released from time to time. Authority was likewise granted to contract with civilian hospitals for the care of disabled ex-servicemen and women.

This work devolved upon the Division of Marine Hospitals and Relief (later known as the Hospital Division) of the Public Health Service which at that time had a total central office personnel of fewer than ten persons. The first step was to secure larger quarters. An old hospital building at 15th Street and Ohio Avenue in Washington was secured. This building in a short time proved inadequate, and it was necessary to move to another building.

As the enormousness of the problem of providing medical care for disabled ex-servicemen and women became understood, the organization of that part of the Public Health Service (the Hospital Division) concerned with this problem began to expand rapidly. There was soon built up an extensive system of hospitals and dispensaries with a commensurate organization to meet a very rapidly increasing demand in all parts of the country. To give an idea of the volume of work involved, the report of the Surgeon General for the year ended June 30, 1920, indicated that at the close of that year, in addition to the original Marine Hospitals, thirty-six additional hospitals had been opened. During that year 87,000 veterans were hospitalized with a total of 3,400,000 hospital days, 500,000 outpatient treatments were given, as well as a total of 350,000 medical examinations.

In carrying forward this work a large medical personnel had been assembled, and the nursing, dietetic, dental, and physical therapy services had been developed together with all of the complex administrative organization which pertains to furnishing medical care on a large scale.

On April 19, 1921, the Secretary of the Treasury issued an order, the effect of which was to relieve the Hospital Division of the Public Health Service of certain administrative responsibilities in connection with the care of former servicemen and women.

This order placed upon the Bureau of War Risk Insurance the administrative responsibility which had previously been discharged by the Hospital Division through its field or district organizaton. There were 14 districts within the continental United States, each headed by a medical officer known as the District Supervisor. State supervisors and subdistrict supervisors were also appointed. In the large cities hospitalization units were established, each with a private hospital as its nucleus with a representative of the Service to administer veterans' medical benefits and a staff of consultant specialists drawn from the community. A "designated examiner," that is, a private physician, was appointed in each county. This order concerning veterans' care tranferred to the Bureau of War Risk Insurance the function of making medical examinations for disability ratings involving the payment of compensation as well as a part of the dispensary medical care, and left the Public Health Service as an agency concerned only in medical care and treatment either in hospitals or in dispensaries. The effect of this order was to make more definite the responsibility of the Public Health Service but it required reorganization.

At that time much discussion was taking place in Congress with the evident intention of the passage of new legislation dealing with the care of veterans. The transfer of administrative responsibility to the Bureau of War Risk Insurance still left the Public Health Service in a state of considerable uncertainty, since it was faced with the difficulty of attempting reorganization on a new basis which in all probability was not to be permanent. Such a situation did not tend to stabilization or to economical administration.

The Service was thus in the very uncomfortable position of being obliged to adopt an attitude of adjustability and to make itself the in-

strument by which medical and hospital facilities for veterans could be increased or diminished to meet the demands of a shifting administrative organization, with grave doubts as to what the ultimate result might be or where the major responsibility would be placed.

Notwithstanding all of this, the Public Health Service, with a fair degree of satisfaction, contrived to make the necessary administrative adjustments with the War Risk Insurance Bureau, the Federal Board for Vocational Education, and various other individual and nonofficial organizations so keenly interested in the care of the veterans.

Veterans' Bureau Established

In the anxiety of many nonofficial organizations to provide immediate and adequate medical, surgical, and hospital facilities for disabled veterans, some of the organizations almost lost sight of the major responsibility of the Public Health Service as the principal Federal health agency. In fact, many of the persons concerned with this did not know of the other responsibilities of the Public Health Service until they came to Washington to draft legislation. Even then, they did not consider it. One draft of a bill introduced into Congress provided that the Public Health Service be transferred to the Veterans' Bureau and be made a division of it. By such action the Director of the Veterans' Bureau would have been not only responsible for the care of veterans, but also for all Federal health functions of the Public Health Service as well. After considerable discussion, a bill was finally passed which resulted in a unification of the three functions—compensation, vocational training, and medical services—under one direction through the creation of the Veterans' Bureau, as an independent agency later designated as the Veterans' Administration. This Act was approved August 9, 1921.

The transition period involving the transfer of Service functions related to veterans to the Veterans' Bureau was marked by a minimum amount of friction, disruption, and lost motion.

HOSPITALS TRANSFERRED TO VETERANS' BUREAU

On April 29, 1922, an Executive Order was signed by the President transferring to the United States Veterans' Bureau all of the veterans'

hospitals then being operated by the Public Health Service. Fifty-seven hospitals were turned over to the Veterans' Bureau, of which 44 were operating at that time. These hospitals had a total bed capacity in round numbers of 17,500 and had approximately 13,000 patients.

For some time the Public Health Service continued to handle the work of the medical care for veterans, particularly in localities outside the continental limits of the United States, such as the Panama Canal Zone, Puerto Rico, the Virgin Islands, the Philippines, and Hawaii.

The transfer of the hospital system to the Veterans' Bureau not only involved a number of properties and an administrative organization, but concerned a good many other matters as well. Chief among these was the question of valuable supplies and equipment which had been accumulated by other government agencies and acquired by the Service. The allocations between the Veterans' Bureau and the Public Health Service of the valuable materials in stock were difficult but were finally completed to the satisfaction of all responsible administrative officials concerned.

At the time the Service was confronted with the problem of providing medical care for disabled veterans of World War I, a good deal of effort was expended in an attempt to determine the probable number of patients over the years and the character of medical facilities that would be required to meet the demands. Public Document No. 481 of the Sixty-sixth Congress presented a comprehensive survey of the question with a proposed program of hospital construction to meet the needs of disabled veterans. This document indicated that within two years from the date of its presentation, which was in the fall of 1919, there would be need of hospital beds for patients of the War Risk Insurance Bureau as follows:

General medical and surgical	7,200
Neuropsychiatric	11,060
Tuberculosis	12,400
TOTAL	30,660

It was also indicated that the peak of the load for the neuropsychiatric and tuberculosis patients would not be reached for some years. It

was proposed that construction and equipment of hospitals to meet this need be undertaken with an estimated total appropriation of $85,000,000. The bill contemplated that this money should be expended in annual installments over a period of several years ending June 30, 1923.

The Service was subjected to a good deal of criticism at that time for the presentation of what was then regarded as a too pretentious program. There was considerable talk, by persons who had not carefully considered the problem, of utilizing the temporary hospitals constructed for the armed forces during the war to provide care for the discharged veterans. It was not clearly appreciated that the wartime hospitals for the care of sick and disabled veterans could not without extensive changes be converted into an adequate and satisfactory system for the care of sick and disabled persons to be operated under peacetime conditions.

Congress did not then deem it wise to appropriate this money or any part of it for hospital construction for disabled ex-servicemen and women. After much discussion, a compromise bill was finally offered involving an estimate of $30,000,000, but Congress did not appropriate money for this purpose at that time. It is significant to note that the magnitude of this problem as forecast by the Public Health Service in Public Document No. 481 has been verified by subsequent experience.

PROFESSIONAL PERSONNEL ASSIGNED TO VETERANS' BUREAU

Following the transfer of the hospitals used for veterans to the Veterans' Bureau in 1922, the Public Health Service continued to assign medical, dental, and nursing personnel to that Bureau until June 7, 1924. The medical and dental personnel consisted largely of reserve officers. Later, these reserve officers were placed on inactive duty and then became officers of the newly created Veterans' Bureau.

There are good reasons for believing that the separation of the hospitals for the care of veterans from the supervision of the Public Health Service was made at the instigation of a veterans' organization, and it may be believed that this was done largely by reason of certain policies followed by the Public Health Service. This veterans' organization felt, and justly so, that the care of veterans was too big a problem to be placed under the supervision of any official organization charged with

other significant responsibilities not directly related to the veterans' problems. Doubtless it was felt that the care of the veteran was a responsibility large and important enough to justify the creation of an official organization whose sole duty would be to deal with the veterans and their problems. The creation of the Veterans' Bureau, which later became the Veterans' Administration, was the result of this feeling on the part of veterans' organizations and of the Congress.

Throughout this period when the work of handling veterans' matters overshadowed other activities of the Service, the attitude of the Congress relative to the veterans' problems was one of uncertainty. The Appropriations Committees of the Congress apparently felt that the cost involved in providing medical care and treatment to the veterans was an unknown quantity and apparently not capable of postulation. In general, members of these Committees and of Congress underestimated the cost of such services with the result that the appropriations made were sufficient for only short periods of time. The Service was directed to return to the Congress from time to time to secure additional funds when and as necessary. The funds were always granted as requested, but continual appearance before the Committees to justify the needed funds was, of course, a time-consuming process.

There was the further difficulty that in attempting to discharge a responsibility, the character and magnitude of which during the first year were not known and not sufficiently appreciated, trustworthy estimates could not be made with any certainty. Since funds were appropriated only as needed, serious embarrassment and often grave difficulties were encountered.

As an example, the appropriation estimates submitted by the Public Health Service for the first year, that is, for the fiscal year ended June 30, 1920, totalled about $16,000,000. This amount was reduced by administrative authority to $4,000,000 and there was appropriated about $3,000,000. Yet the total expenditures for this program covering this period approximated $20,000,000. The appropriation climbed in succeeding years to upwards of $40,000,000 annually.

One feature of the rapid increase in the number of hospitals operated by the Service for the care of veterans deserves special comment. The

establishment in quick succession of new hospitals, largely with new and untried personnel, with the attendant circumstances sometimes of disorder and confusion, inevitably created a situation possessing strong elements of instability. Those in administrative authority always felt a sense of uneasiness over the adverse possibilities of such a situation. An unusual watchfulness was exercised in the supervision of these hospitals as they were opened and placed in operation. It speaks well for all the personnel concerned that a very small number of untoward incidents occurred in the conduct of these hospitals during that period.

The tremendous administrative burden incident to the expansion of the hospital facilities of the Public Health Service in handling medical care for sick and disabled veterans of World War I fell principally upon Dr. Claude H. Lavinder, who became Chief of the Hospital Division in 1919. Doctor Lavinder was ably assisted during this period by a number of medical officers including Dr. Walter L. Treadway in psychiatry, Dr. Frederick C. Smith in tuberculosis, and Dr. Robert W. Hart in surgery.

The early medical advisers of the War Risk Insurance Bureau were officers of the Public Health Service. Dr. Charles E. Banks was the first officer who served in that capacity. He was succeeded by Dr. William Colby Rucker. With the establishment of the Veterans' Bureau in 1921, Dr. Haven Emerson of New York was appointed medical adviser.

The responsibilities and duties imposed on the Public Health Service by the emergency care and treatment of veterans of World War I and the influenza epidemic, made the years, 1918, 1919, and 1920, the most momentous period in the history of the Service up to that time.

CHAPTER XI

World War II

There is no affinity nearer than our country.—PLATO

War Clouds Gather

PRESIDENT WOODROW WILSON signed the Selective Military Conscription Act on May 17, 1917. Surgeon General Rupert Blue of the Public Health Service at that time had under his direction a total force of 2,000 persons. President Franklin D. Roosevelt signed the Selective Service Act on September 16, 1940. The Public Health Service led by Surgeon General Thomas Parran at that time numbered 9,500 paid personnel, of whom 8,700 were on full-time duty.

Each of these dates marks the time at which the United States committed its manpower and material resources to a world war. In the case of World War I, conscription followed the Nation's entry into war by two months. In World War II the Selective Service Act preceded Pearl Harbor by 15 months. In each of these cases it was the operation of the draft which precipitated upon the Public Health Service extraordinary demands for medical, public health, and investigative activities as well as for participation in the activities of the armed forces, other Federal agencies, and civilian health services.

The widespread activities and participation of the Public Health Service in World War II are related here in some detail, as its contribution in actual combat and elsewhere in the vast field of military and associated operations of the world conflict assisted in no small measure in the success of the war effort. It is felt, therefore, that these achievements deserve somewhere an authentication, both as a part of a permanent historical record of the Service and as a helpful pattern in case of future war. With a pardonable pride, the following account of the role played by the Public Health Service in World War II is presented.

Civilian Health in World War II

During the two years just prior to Pearl Harbor the administrative patterns and the legislative authorities were developed by which the Public Health Service operated its wartime programs for the civilian population. Changes and expansions occurred as particular problems grew in importance during the war, but the role of the Public Health Service as defined and enacted between January 1940 and January 1942 remained as the basic relationship of the Service with the Army, Navy, and other Federal agencies as well as State and local health authorities and nonofficial agencies in civilian health protection.

The gathering war clouds in Europe in 1939 were clearly seen by the Administration and the Congress. Steps were taken to strengthen the military and naval services. The Public Health Service, like many other Federal agencies, began to speculate as to what it would be called upon to do and how best it could serve in the defense of the Nation. Delay in determining the role of the Service in World War I had worked definite hardship upon the organization itself and had serious repercussions upon the public health. Recognizing the fact that in wartime the military services must have priority both in the utilization of national resources and in decisions as to how they shall be used, the Public Health Service sought the formulation and adoption of a clear-cut policy with respect to its relationships with the armed forces in the plans for national defense. Informal conferences were held as early as May 1939 by the Public Health Service and the War Department in order to ascertain the plans and thinking of the General Staff of the Army.

Surgeon General Parran, in a letter to Assistant Secretary of War Louis Johnson, under date of May 10, 1939, inquired as to what plans the General Staff of the Army might have for the Public Health Service in relation to national defense. This letter summarized the professional resources of the Service and its potential ability to expand these resources through the Reserve Corps. A staff study was immediately initiated by Mr. Johnson on the questions raised by Doctor Parran, and later in the month he conferred with Surgeon General Parran and Dr. Warren F. Draper. Present at this conference also were Lieutenant General Malin Craig, Chief of Staff of the Army, and Major General James C. Magee,

Surgeon General of the Army. At this conference were considered the legal decisions made in World War I, and later in 1921, as to the military status of the Public Health Service.

It was the opinion of the General Staff of the Army that it would not be wise in time of war to place the commissioned corps of the Public Health Service under the control of the War Department. It was felt that the full power of the Public Health Service should be directed toward supervision and control of civilian health, especially in areas contiguous to military establishments and in the war industries. At that time General Craig stated:

> The War Department plans to obtain the cooperation of the Public Health Service in time of war in the same manner as was done in the World War and also to request the occasional temporary assignment of individuals in instances of emergency requiring it; to utilize the existing hospital facilities of the Public Health Service if needed in the early stages of mobilization; and to investigate the possibilities of training needed for medical technicians in the existing laboratories of the Public Health Service.

The point of view of the War Department and the Army had been altered by the experience in World War I and the intervening years. The independent status and the cooperative role of the Public Health Service were understood and accepted. The Service, on the other hand, remembered the difficulties it had experienced in World War I in retaining essential personnel and in maintaining morale in the commissioned corps. Further discussions with the military authorities during the summer of 1939 resulted in a decision by the War Department that it would not be legally feasible to incorporate the Public Health Service with the Medical Department of the Army. The War Department at this time did not support the idea that the commissioned corps of the Public Health Service should be included in emergency legislation granting to it the full rights, privileges, and benefits conferred upon military personnel in time of war (letter of Surgeon General James C. Magee of the United States Army to Surgeon General Parran dated August 4, 1939).

LIMITED NATIONAL EMERGENCY DECLARED

After the outbreak of war in Europe the President declared a state of limited national emergency and defense activities were accelerated.

An immediate expansion of military activities occurred in the southern part of the United States. In formulating plans for maneuvers in the spring of 1940, the War Department turned to the Public Health Service for assistance in organization of public health activities in the extra-military areas.

Secretary of War Harry H. Woodring formally requested the cooperation of the Public Health Service in a letter dated January 30, 1940, addressed to the Federal Security Administrator, a letter which officially established the relationship of the Service with the Army throughout the war:

> I am writing in this time of limited emergency to request that the United States Public Health Service again afford to the Army the fine cooperation and support it gave during the World War under the provisions of law and the Executive Order of April 3, 1917.
>
> It is desired that the U. S. Public Health Service, operating under the authority of existing laws and using its own resources, cooperate with the Army in safeguarding the health of military personnel by suitable measures of extra-military area sanitation in connection with the present concentration of troops in the South. This cooperation is particularly desired at this time in regard to the increase in venereal disease which has been traced directly to organized vice in adjacent municipalities. Other matters of environmental sanitation will arise during the course of the coming maneuvers in which the U. S. Public Health Service can be of great assistance to the Army.
>
> I would appreciate hearing from you as to the extent and character of assistance the U. S. Public Health Service will be prepared to give the Army.

Federal Security Administrator Paul V. McNutt, replying to Secretary Woodring, gave assurance that the type of cooperation in question would be extended gladly by the Public Health Service as far as its resources would permit. A similar exchange of correspondence passed between the Secretary of the Navy and the Federal Security Agency Administrator.

RECONNAISSANCE SURVEYS PRIOR TO MILITARY MANEUVERS

A joint conference was held on March 7, 1940, by representatives of the Army, Navy, and Public Health Service to work out plans for maneuvers which were to be held from the middle of April through October 1940 in various parts of the country. The first decision was

that a reconnaissance team of Service officers should immediately survey the maneuver areas, report the results, and make recommendations as to what public health measures must be applied for the health protection of the armed forces.

Thus, the concept of the reconnaissance survey was developed. Before the close of 1940 the Public Health Service had adopted the reconnaissance survey as its health intelligence technique, extending such surveys to every military and war industrial area in the United States and its possessions.

The first reconnaissance team was composed of Medical Director Claude C. Pierce and Senior Sanitary Engineer H. Norman Old. The team left Washington on March 12, 1941, to survey maneuver areas in Georgia, Louisiana, and Texas prior to the spring maneuvers, April 15 to June 1.

After conferring with the staff of the Fourth Service Command and the Georgia Public Health Department at Atlanta, Georgia, the Louisiana State Health Department at New Orleans and personnel of the Public Health Service in the District Office there, the Eighth Service Command of the Army at San Antonio, Texas, and the Texas State Health Department at Austin, the team set out for the maneuver areas. (Until 1941 the term "Corps Area" was used by the Army. After that date the term "Service Command" came into use.) Doctor Pierce and Mr. Old held meetings with leading citizens and local government officials in the communities located in the maneuver areas. At these meetings local individuals were acquainted with the public health problems likely to arise when the maneuvers were held. An attempt was made to persuade the local authorities to strengthen their health services for the protection of the health of the troops. Good cooperation was secured from the State health agencies and from some local governments. After returning to Atlanta on March 22, Doctor Pierce and Mr. Old visited Columbus, Georgia, from which point was to be dispatched the "opposing Army" in the maneuvers.

Upon arriving in Washington on March 25, Doctor Pierce and Mr. Old immediately conferred with Public Health Service Headquarters and the staff of the Surgeon General of the Army. The Army proposed to protect the troops in the maneuver areas by printed information and

orders to use nets against malaria, not drink raw milk, beware of stray dogs to guard against rabies, avoid impure drinking water, and avoid eating food from wayside vendors. Prophylactic kits and pamphlets on venereal diseases were to be distributed. Mobile water purifying plants were to dispatch water to the troops in 10-gallon milk cans. Latrines were to be dug for each overnight camp and refilled before departure. Any additional public health measures were to be applied by State and local agencies.

The Public Health Service and the State health authorities set up two emergency health units, one at Leesville, Louisiana, and one at Jasper, Texas, to deal with the immediate problems. A letter was sent to local and State officials requesting cooperation in the suppression of prostitution, the illegal sale of intoxicants, and the prevention of an influx of itinerant food vendors. The Louisiana State sanitary engineers agreed to inform officers of the Medical Corps of the Army regarding water supplies and other sanitation problems in that State. The Texas State Health Department supplied twenty public health workers to staff the unit at Jasper.

Dr. Arthur B. Price was detailed to the Louisiana State Health Department to act as West Maneuver Area Health Officer with headquarters at Leesville, Louisiana. The West Maneuver Area incorporated seven parishes (counties). At the outset only two of these parishes had health units, and neither of them was adequately organized or developed. The staffs of these units and 11 public health workers from the State health department composed the Maneuver Area Health Department. This was the public health organization available to deal with the problems of 60,000 troops in the April maneuvers. Before the second group of 90,000 troops arrived for maneuvers in August, all but one of the parishes (counties) had been stimulated to establish health departments.

The major public health problems encountered by the West Maneuver Area Health Department were those which continued to plague extra-military zones throughout the war. The number one problem was the spread of venereal diseases. Food sanitation, safe milk and water, ice and refrigerants, shelter, and recreation, all were inadequate and insufficient.

In the first maneuvers the Army issued food cards to the men. With these the soldiers could eat only at approved restaurants in the area; there were, however, but few such approved restaurants. There was almost no pasteurized milk in the area. The best the health department could do was to suggest certain dairies for raw milk.

In the incorporated communities, the Maneuver Area Health Department kept the water supply up to acceptable standards for drinking water. Outside those communities there was no control. Housing became a critical problem immediately, for many of the men brought their families with them.

The rising rates of venereal infection in military personnel, the weakness of the venereal disease control program, and the lack of control of the emigration of prostitutes into war areas in Louisiana led to the adoption of three important methods by the West Maneuver Area Health Officer: (1) the establishment of detention quarters for infected prostitutes, (2) the employment of nonprofessional personnel as contact tracers, and (3) the adoption of an epidemiologic report on contacts.

These three activities, which had their origins in the West Louisiana maneuvers of 1940, were to develop during the war into three basic advances in venereal disease control methods, namely: (1) The rapid treatment center program; (2) the employment of public health representatives; and (3) the epidemiologic intelligence plan for exchange of information between the armed services and the civilian health authorities.

While maneuvers were going forward in the South, Dr. Otis L. Anderson and Dr. David C. Elliott formed a Service reconnaissance team to survey the maneuver areas in Minnesota and Wisconsin. Survey teams were also dispatched to survey maneuver areas in the States of New York and Washington.

The experience of the Public Health Service and the Army in the maneuvers conducted in August of that year in Wisconsin were in contrast with the experience in the South. The principal factor which contributed to better public health controls in Wisconsin was the existence of a stronger State health authority which had longer experience in State-wide coordination of health services. Another factor was that with a larger margin of time, the Wisconsin State Health Department had

more opportunity to prepare for the maneuvers as compared with that afforded the southern health authorities.

Dr. C. A. Harper, State Health Officer of Wisconsin, after consulting with the reconnaissance team from the Service, earmarked a special fund for health services in the maneuver area where 60,000 soldiers were to be concentrated. He and his staff met with local officials in the communities concerned. When these officials stated that their staffs were not large enough to handle the problem, the health department appointed deputies to act both as Deputy State Health Officer and as Deputy Sheriff.

The Governor of Wisconsin declared an emergency and established the maneuver area as a military zone. All highways into the zone were patrolled. The State authorities forbade the establishment of new restaurants. All public water supplies were under the control of State sanitary engineers. The military authorities reported to the State health department every woman known to have transmitted a venereal disease to a soldier. During the maneuvers only 60 women were arrested in the area, and those from out of State were returned to their homes. Doctor Harper, in summarizing the experience stated that only four new cases of venereal disease occurred among the soldiers during these maneuvers, none of which was syphilis. In the civilian population only one new case of venereal disease (gonorrhea) was registered during the maneuvers.

RECONNAISSANCE SURVEYS EXTENDED TO CRITICAL AREAS

The national intensification of the defense program resulted in the extension of reconnaissance surveys to all critical areas. Medical and engineer officers of the Service collaborated in outlining the types of information needed to define the emergency health problem in each area and to make constructive recommendations for its solution. The Army and Navy agreed to furnish the Service with lists of defense establishments, both military and industrial, which were to be created or expanded. It was realized by the Service that a rapid increase of civilian population did occur in the affected areas and that many of the communities were not prepared to accommodate the newcomers. The Service further realized that no orderly preparation could be made and

no adequate safeguards could be maintained without plans based upon specific health intelligence.

Each District Office of the Service was supplied with a list of defense areas in its jurisdiction and was instructed to send reconnaissance teams to make the surveys and submit reports to headquarters. Prior to surveying a State, reconnaissance teams discussed the entire health problem in critical areas with the State Health Officer. Usually, State and local health authorities accompanied the reconnaissance teams, and much of the information incorporated in the surveys was provided by them.

In general, a reconnaissance survey included for each area, and for each political subdivision in each area, complete and detailed information covering population, description of military and industrial establishments, transportation facilities, topography and geology, political organization, water supplies, sewage disposal, food control, milk sanitation, garbage and refuse disposal, housing, public health organization and facilities, hospital facilities, medical and dental personnel, and welfare organizations.

The extension of reconnaissance surveys from the maneuver areas of 1940 to all extra-military and industrial areas began in November 1940. At the close of 1943, 476 areas had been surveyed. A resurvey was made of all areas in 1944.

At a time when various agencies, each having some interest in public health problems, were being established, the Public Health Service was already prepared with current information, a remarkably complete understanding of the nation-wide problem, and a functioning organization to determine the ever-recurring changes in the civilian life of those areas in wartime. The plans of military and naval authorities often had to be changed overnight in accordance with the exigencies of the war, but the organization of the Public Health Service, with its field staff widely dispersed and augmented by its close working relationship with State and local health authorities, was sufficiently flexible to meet the emergency created by such changes.

The demands placed upon the Service by the military authorities were usually easily met. However, the administrative difficulties which resulted from the organization and reorganization of civilian war agen-

cies often placed exceptional hardships upon the field staff of the Public Health Service. The failure of such agencies to utilize the health intelligence data already in the possession of the Public Health Service caused many delays in meeting critical needs in war areas. Between January 1942 and January 1945, it was not unusual for a critical war area to be surveyed and resurveyed five or six times before action could be taken to relieve a specific and serious condition.

In the first two years after Pearl Harbor the conversion of an entire nation for total war proceeded so rapidly that at no one time was it possible to give a summary of civilian health needs in all war areas. By the close of 1943 the situation had been somewhat stabilized; therefore, reconnaissance surveys made in 1944 afforded an accurate picture of the status of basic health and medical services at the peak of the war. Reconnaissance surveys in the latter part of 1944 covered 476 areas in the continental United States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. One-third of the population of the United States resided in those areas in 1940. Registration of the entire population for ration book No. 4 on November 1, 1943, showed that the population of those areas had increased by approximately 2,448,000.

State and local health departments, as well as local hospitals, were in a critical state in 1944. The demands of the military services had reduced severely the staffs of health agencies and hospitals throughout the country. In addition, the higher wages and better conditions of work offered by industry and Federal agencies had cut still deeper into the supply of health and hospital workers. The reconnaissance surveys made by the Public Health Service showed that from month to month the status of health services grew worse as the war effort intensified. The Public Health Service had expended all of its resources to bolster the weakening health forces, but the situation at the close of 1944 was indeed critical. In 31 of the 476 war areas, including 38 counties, approximately 1,200,000 people had no organized, full-time health services, and in 88 areas, including 121 counties, 2,500,000 people had no public health services whatsoever. Public health services were lacking or seriously deficient in more than 22 percent of the communities surrounding important Army, Navy, and industrial establishments at the peak of the war.

PUBLIC HEALTH WORK IN WAR AREAS

The demands of the Army and Navy were not the sole cause of the inadequacy of public health protection in the war areas. In 1940 the Public Health Service had recommended the minimum expenditure for public health services of $1.00 per capita per year. Such a proportional expenditure had long been the accepted standard recommended by professional organizations such as the American Public Health Association. In 1944 only 62 war areas (13 percent) budgeted $1.00 or more per capita for public health work. Eighteen areas spent less than 10 cents per capita per year for public health activities.

In 1944 the entire public health force in these areas totaled 12,450 persons, of whom 267 were officers and other employees of the Public Health Service assigned to those areas under the Emergency Health and Sanitation Program.

A study of the effect of the war on the distribution of full-time local health officers in the continental United States showed that between 1941 and 1945 the total number of full-time local health officers had decreased by 13 percent. During the war the number of political units covered by some type of organized health service increased four percent, but the number of health departments headed by full-time health officers decreased 11 percent. In 1945 only 48 percent of the counties had a health officer. Despite the large number of emergency health and sanitation personnel assigned by the Public Health Service to State health departments for duty in war areas, the direct contribution of the Service to local health departments in 1945 was small. Only 42 Service officers were acting as local health officers at that time.

In 1941 the South was more highly organized as regards local health services with full-time medical health officers than any other part of the country, while in the West, local health organizations were virtually non-existent. The South lost about 20 percent of its full-time local health officers during the war.

The reconnaissance surveys of 1944 also showed that two-thirds of the war areas (314) did not meet the wartime standard set by the Procurement and Assignment Service (War Manpower Commission) of at least one practicing physician to each 1,500 population. Eighty-five

percent failed to meet the minimum standard established by the same organization of at least one practicing dentist to each 2,000 population.

By the end of 1944 the health facilities programs administered by the Federal Works Agency had met the more urgent needs for new hospital beds in 170 war areas. Reconnaissance surveys showed, however, that only 109 of the total 476 areas met the minimum standard of 4.5 general hospital beds per 1,000 population. In 19 critical war areas, no hospital facilities were available. Ninety-six health centers had been constructed at a cost of slightly more than $4,000,000 in 86 areas. Nearly 95 percent of this construction was from Federal funds.

By December 2, 1944, water, sewerage, garbage disposal, and other sanitary facilities had been constructed under the direction of the Federal Works Agency at a total cost of almost $180,000,000. These facilities included improvement of 453 waterworks and 449 sewerage and sewage disposal systems in 45 States, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Local communities had spent, in addition, slightly more than $28,000,000 to improve the water systems and almost $7,000,000 on their sewerage systems. The total expenditures for these basic facilities by State and local governments during the war, however, was small when the increased tax resources of those authorities are taken into account. The total expenditure in war areas by State and local governments for waterworks, sewerage, garbage disposal and other sanitary facilities in the period 1941-1944 was less than $72,000,000 as compared with the Federal expenditure for civilian sanitary facilities of approximately $180,000,000 during the same period. It is true that after the organization of the War Production Board in 1943, it became increasingly difficult for State and local governments to obtain materials and labor for the construction and maintenance of sanitary facilities.

Milk and food sanitation in war areas had deteriorated markedly in 1944. Only 63 percent of the areas had milk sanitation that could be rated as good or fair. In 31 areas covering 137 communities, there were no milk sanitation programs of any kind. Food sanitation, principally sanitation of public eating establishments, was deplorable in 45 percent of the areas, only 241 of which could be rated as good or fair. The deficiencies in the milk sanitation program and a lack of training for employees in public eating establishments were especially notable. Under

the stimulation by the District Offices of the Public Health Service and sanitary requirements of the military authorities, many communities did adopt standard milk and food ordinances. At the close of 1944, 339 communities in 81 war areas had adopted the Public Health Service milk sanitation ordinance, and 200 communities in the same areas had adopted the food sanitation ordinance. In about 90 percent of the areas, 50 percent of the market milk supply was pasteurized, and in 15 percent of these areas 100 percent of the milk supply was pasteurized.

HEADQUARTERS STAFF

It is interesting to note the background of the officers of the Service in charge of important administrative assignments in Washington during World War II and to observe where these men, as young officers, were on duty during World War I. Doctor Thomas Parran in 1917, then an Assistant Surgeon, was in Okmulgee County, Oklahoma, in the rural sanitation program under the direction of Dr. Leslie L. Lumsden. Eight of the nine officers on Surgeon General Parran's staff in 1943 were on duty as follows in 1917: Deputy Surgeon General Warren F. Draper was in charge of the extra-cantonment sanitation zone at Newport News, Virginia. Assistant Surgeon General R. Eugene Dyer was working with Dr. Joseph Goldberger in South Carolina on pellagra studies. Assistant Surgeon General Lewis R. Thompson was engaged in public health administration with Dr. John D. Long in the Philippines. Assistant Surgeon General Charles L. Williams, Sr., was in charge of plague eradication and interstate sanitation at San Francisco. Assistant Surgeon General John K. Hoskins was with Dr. Wade H. Frost at Cincinnati on the Ohio River survey. Assistant Surgeon General Carl Michel, Chief Medical Officer of the Coast Guard, and Assistant Surgeon General Justin K. Fuller, Chief Medical Officer of the War Shipping Administration, were at that time on duty in European waters with the Coast Guard Cutters *Itaska* and *Algonquin,* respectively. Assistant Surgeon General Ralph C. Williams was assigned to the Bureau of Mines and was on duty with Mine Rescue Car No. 2 in Raton, New Mexico. Assistant Surgeon General W. Thomas Wright was not then in the Service because dental officers did not enter the Service until 1919.

LIAISON OFFICERS

The work of the reconnaissance teams in the maneuver areas in the summer of 1940 had demonstrated the value of liaison work in the field between Army Service Commands and the Public Health Service. With the passage of the Selective Service Act, it became clear that liaison would have to be extended and placed on a more permanent basis. The Public Health Service had accepted the responsibility of insuring adequate health organization in the defense areas, but it had no funds with which to increase its staff or its assistance to the Army and the States in emergency health work. However, the Service recognized that it would be impossible to use existing Federal, State, and local resources efficiently unless some arrangement were made whereby military and civilian health authorities could be kept informed on their common problems.

With the exigencies of mobilization and the growing threat of war in mind, Surgeon General Parran decided early in 1940 to assign a medical officer to each of the Army Service Command headquarters. As Liaison Officers of the Public Health Service, these officers were to function independently but in close cooperation with the Surgeon of the Army Service Command. Since medical officers of the Army in such assignments usually held the grade of colonel, it was necessary to appoint Service officers of comparable grade. It was not easy to find nine senior officers of the Regular Corps who could be spared from their current assignments, nor was it easy to find such officers who had experience in extra-cantonment work during World War I, or in public health administration in peacetime. The accelerating defense program was straining the resources of the Service in every phase of its work. The Regular Corps of the Public Health Service in October 1940 included 404 officers. Of that number approximately one-fourth had experience in various types of public health administration. Most of the officers having such experience were in the lower grades corresponding to major and below. It was not until 1943 that authority was given to the Service by Congress which permitted temporary promotion of officers in time of war or national emergency.

The importance of establishing liaison with Army Service Commands was such that Surgeon General Parran informed his staff that all officers

with public health experience would be considered immediately available for duty in connection with mobilization, regardless of their current assignments. Accordingly, the first Liaison Officers received their orders on November 1, 1940.

Liaison Officers were assigned to San Juan, Puerto Rico, the Military District of Washington, D. C., and Alaska, shortly after the attack at Pearl Harbor. Liaison Officers were also assigned to both the Sixth and Seventh Service Commands which had previously been served by one officer. A list of Liaison Officers and their assignments covering the period November 1940 to July 1946, is as follows:

First Service Command Headquarters, Boston, Massachusetts
Medical Director Joseph Bolten, November 1940-June 1942
Senior Surgeon Roy E. Bodet, June 1942-June 1943
Senior Surgeon Oswald F. Hedley, June 1943-September 1944
Senior Surgeon Ernest E. Huber, September 1944-June 1946

Second Service Command Headquarters, Governors Island, New York
Senior Surgeon Albert E. Russell, February 1941-August 1945

Third Service Command Headquarters, Baltimore, Maryland
Senior Surgeon Edgar W. Norris, November 1940-October 1943
Surgeon Frederick W. Kratz, October 1943-October 1945
Medical Director Mark V. Ziegler, October 1945-June 1946

Fourth Service Command Headquarters, Atlanta, Georgia
Medical Director Louis L. Williams, Jr., December 1940-February 1942
Senior Surgeon Robert H. Onstott, February 1942-August 1943
Medical Director Joseph Bolten, August 1943-January 1946

Fifth Service Command Headquarters, Fort Hayes, Columbus, Ohio
Senior Surgeon Frank V. Meriwether, November 1940-September 1942
Senior Surgeon Ralph Gregg, September 1942-April 1944
Senior Surgeon Charles F. Blankenship, April 1944-June 1946

Sixth Service Command Headquarters, Chicago, Illinois
Medical Director Lon O. Weldon, November 1940-August 1941
Senior Surgeon Adolph S. Rumreich, August 1941-August 1946

Seventh Service Command Headquarters, Omaha, Nebraska
Medical Director Lon O. Weldon, April 1942-May 1946

Eighth Service Command Headquarters, San Antonio, Texas
(Headquarters changed to Dallas, Texas, effective November 1942)
Medical Director Knox E. Miller, February 1941-July 1946

Ninth Service Command Headquarters, Fort Douglas, Utah
Senior Surgeon Walter T. Harrison, February 1941-January 1942
Senior Surgeon Paul D. Mossman, January 1942-April 1944
Senior Surgeon, Austin V. Deibert, April 1944-July 1946

Antilles Department Headquarters, San Juan, Peurto Rico
Medical Director Joseph Bolten, June 1942-July 1943
Medical Director Raymond A. Vonderlehr, July 1943-January 1947

Northwest Service Command, Whitehorse, Yukon, Alaska
Senior Surgeon (R) George A. Hays, December 1942-October 1943
Senior Surgeon Edgar W. Norris, October 1943-January 1944
Senior Surgeon (R) George A. Hays, January 1944-June 1945

Alaskan Department, Juneau, Alaska
Senior Surgeon Edgar W. Norris, June 1944-July 1946

Military District of Washington, D. C.
Surgeon Noka B. Hon, May 1943-September 1944
Senior Surgeon Frederick W. Kratz, September 1944-October 1945
Medical Director Mark V. Ziegler, October 1945-June 1946

Before reporting to duty at Service Command Headquarters, the Liaison Officers assembled in Washington for a conference on November 6 and 7, 1940. Surgeon General Parran and members of the Headquarters staff of the Public Health Service and representatives of the Army participated. The purpose of the meeting was to discuss the responsibilities of Liaison Officers, the organization of their tasks, and their relationships with other agencies.

At the conference of Liaison Officers in November 1940, they were advised that they "must function through the District Offices of the Public Health Service and the State Health Departments," but that they would not be an integral part of the Army Service Command or the District Office of the Service.

Liaison Officers were also advised that they were expected to inform District Directors of the Service as to the activities they wished to carry out in the States. The District Directors in turn should work through the Liaison Officer in presenting problems to the military authorities. In summing up the relations and responsibilities in liaison work, the statement was made that:

> The Liaison Officer is accountable to the State Health Officer and through him to the local health officer when working in an extra-military zone. He should feel

responsible for the proper set-up in each particular locality and for getting things going. He must decide what should be done to protect the troops to his own satisfaction and the satisfaction of the military authorities, of course working in conjunction with the State and local health authorities.

Liaison Officers were expected to assemble factual material such as would keep them informed at all times on the health situation in their areas and to submit monthly reports to the Surgeon General of the Service. In addition, reports of special surveys and inspections were made. Office space and equipment were provided at each Service Command headquarters by the Army. Stenographic services and transportation were provided by the Public Health Service. When technical assistance was needed, the District Offices of the Service were expected to assign qualified personnel to work with the Liaison Officer. The assignment of personnel to State or local health organizations remained the responsibility and function of the Headquarters of the Service through the District Directors.

The Liaison Officer had the primary responsibility of interpreting the health needs of the military forces to State and local health authorities on the one hand, and on the other of interpreting State and local health laws, facilities, and conditions to the Army officers concerned with medical and sanitation activities within military establishments. In carrying out this responsibility, he worked directly with the Surgeon of the Service Command and with the Post Surgeons. It was the concept of both the Surgeon General of the Army and the Surgeon General of the Public Health Service that the relationship between the Liaison Officer and the military authorities should be informal and cooperative. For that reason the Liaison Officer was responsible to the Surgeon General of the Public Health Service rather than to the Commanding General of the Service Command. However, he acted as a public health adviser to the Service Command and maintained a constant interchange of information as to health conditions in civilian communities and in military establishments.

RELATIONSHIP OF LIAISON OFFICERS WITH STATE AND LOCAL HEALTH OFFICERS

The relationship of the Liaison Officer to State and local health authorities also was independent. He was free to work in association with

State and local civil authorities in investigating health conditions and in stimulating the development or improvement of local health organizations. The Public Health Service expected the Liaison Officer to interest himself in the total health program as it was organized and administered in each defense area under his supervision. He was expected to make periodic inspections, as well as thorough surveys and to submit recommendations for the solution of important problems. The subjects of major interest were venereal disease control, acute communicable disease control, sanitation, including sanitary conditions in civilian housing, and provision of health and medical services in civilian communities.

As the war effort expanded, the inter-relationship of the District Directors of the Service and the Liaison Officers became more apparent. In most Service Commands the Headquarters were located in cities distant from the District Office. At the same time, many important military establishments were located nearer to the District Office than to the Service Command. In many cases the distances were very great. Transportation even for Government officials in the field was often difficult to obtain. Hence, because of their mutual interests, responsibilities, and problems, the Liaison Officer and the District Director came more and more to work as a team, each handling the jobs close at hand, either as his own responsibility or on behalf of the other. Freed of administrative responsibility, the Liaison Officers were able to spend most of their time in the field and by constant association with the problems in the making, they were able to anticipate and avert serious situations. Many of them became exceptionally able reporters. Their eye-witness accounts of health conditions in civilian communities during the war constitute some of the most informational and colorful documents of the Public Health Service.

From the military authorities in 1944 came enthusiastic endorsement of the extra-military zone sanitation and disease control program of the Public Health Service and of the value of the Liaison Officers to military authorities. Many of the Surgeons of the Service Commands stated that they could not have performed the functions of coordination with civilian health authorities effectively without the Liaison Officers of the Service.

Emergency Health and Sanitation

When the 38th Annual Conference of State and Territorial Health Officers convened in Washington on May 9, 1940, the spring maneuvers of the United States Army were in full swing. The only specific mention of the National Defense Program was by Dr. Raymond A. Vonderlehr, at that time in charge of the Division of Venereal Diseases. Doctor Vonderlehr presented to the Conference the exchange of correspondence between the Public Health Service and the War and Navy Departments defining the role of the Service in the defense program. Surgeon General Parran discussed the relationship between the venereal disease control program and the current concentration of military forces. Dr. Robert H. Riley, Director of the Maryland State Health Department, presented for consideration a proposed agreement by the Public Health Service, the Army, Navy, and State health departments for the control of venereal disease in extra-military zones. Attention was also called by Dr. Joseph W. Mountin to the general public health problems that might arise in connection with national defense. The Conference of State and Territorial Health Officers approved the proposed agreement for venereal disease control but made no other recommendations relative to the emergency. The day after the Conference, May 10, while many of the State health officers were still in Washington, Germany invaded Belgium, the Netherlands, and Luxemburg.

In the succeeding disturbed months, many alert State health officers foresaw that the international conflict would eventually involve the United States. Many of them had specific experience which indicated the trend of the defense program and the war in relation to the public health structure of the country. The number of physicians and sanitary engineers in State and local health departments who held reserve commissions in the Army, Navy or National Guard was not definitely known. During the summer of 1940, many State health officers importuned Surgeon General Parran to determine if possible the policy of the War Department and of the Army as to the status of State and local health personnel who held reserve commissions. Doctor Parran accordingly, on September 9, 1940, laid the matter before Surgeon General James C. Magee of the Army.

SHORTAGE OF PUBLIC HEALTH PERSONNEL

Public health organizations in the United States were confronted by a critical situation. There were not more than 2,000 full-time medical officers of all ages in public health work. Under Title VI of the Social Security Act, a strenuous effort was being made by the States to secure specially trained personnel. Substantial sums of money had been invested in providing fellowships and paying tuition in schools of public health for young physicians, engineers, nurses, and other health personnel undertaking careers in State and local health services. Doctor Parran pointed out that in order adequately to protect the national health, a considerably larger number of trained personnel was needed than was available. The State health officers realized that the mobilization would impose enormous problems and burdens on the health services of the nation at a time when public health controls in civilian communities would be more important than ever.

When a special conference of State and Territorial Health Officers was called for September 16, 1940, the Public Health Service had not been informed by the War Department as to the induction status of public health personnel holding reserve commissions. Surgeon General Magee replied under date of October 17, 1940, stating that only reserve officers holding "key" positions in the Federal government would be deferred until suitable replacements could be obtained and that only those holding "key" positions in munitions industries would not be called up immediately. The deferment of individual officers could be determined only by the immediate requirements of the national defense. Therefore, the proposal made by Surgeon General Parran to place on a deferred list all reserve officers "holding full-time positions of strategic importance in State and local health services" could not be accepted by the War Department. Surgeon General Magee believed that the provisions in force at that time for the selection of reserve officers for active duty by the Army would meet the needs of State and local health agencies until July 1941 or longer. Individual cases of hardship to communities and health services could be brought to the attention of Surgeon General Magee. By June 1941 there were 500 vacancies in medical officer positions in the State and local health departments.

SPECIAL CONFERENCE WITH STATE HEALTH OFFICERS

A special conference of State health officers convened on September 16, 1940, the day the Selective Training and Service Act was approved. Surgeon General Parran in presenting the problems which the Conference must consider stated:

> The most impelling problem which we face today is that of maintaining the safety of this country and its institutions. For their aggressive defense, we are gearing up governmental methods, mobilizing resources and manpower.
>
> For the first time in our history, world events have thrust upon us the concept of a total war. In preparing a total defense, all factors ultimately rest upon the one fundamental resource of the country—manpower. Medicine and public health through the centuries have been devoted to the conservation of manpower and its socially constructive use.
>
> Pursuant to the Act of July 1, 1902, you have been called today to meet for the consideration of ways and means by which we may take the first steps through coordinated Federal and State action to conserve and utilize the vital resources of our country for national defense.
>
> In addition to the State and Territorial Health Officers and our National Advisory Health Council, I have invited representatives of other Federal agencies concerned and of professional and voluntary agencies. This is desirable because of the complexity of many of the problems with which we are faced. Also, we need now, as never before, an integrated effort on the part of all agencies which represent the purpose of our citizens to attain personal and national health.
>
> The Federal government has planned a closer coordination of health activities to promote national defense than we have ever known before. We now have a coordination of civilian health problems with social welfare, children's problems, nutrition, and other consumer interests under one of the seven members of the Advisory Commission to the Council of National Defense. We may anticipate soon a further coordination of medico-military and health defense problems as a major preparedness measure.

The immediate problems for discussion were: (1) status of key position personnel in essential health and medical services; (2) the physical status of registrants under the Selective Service Act; (3) health and sanitation in defense areas; and (4) resources for industrial hygiene work in defense areas.

In addition to the State and Territorial Health Officers and the National Advisory Health Council, representatives of various national organizations participated in the Conference, including the National

Defense Council, National Research Council, and the Surgeons General of the Army and Navy as well as representatives from the national professional organizations of medicine, dentistry, and public health.

The recommendations adopted by the State and Territorial Health Officers at the close of the two-day conference may be summarized as follows:

1. That the Public Health Service secure the necessary supervision and personnel for the maintenance of health services in defense areas; that it formulate minimum standards for sanitation, disease control, and administration of services, and that it coordinate the work of local authorities.

2. That the War and Navy Departments and other defense agencies adhere to State sanitation laws in the construction and maintenance of public water supplies and sewage treatment in military establishments.

3. That the Selective Service System abide by State laws for reporting communicable diseases, including venereal disease and tuberculosis, to State health authorities.

4. That men rejected for military duty because of physical defects be made legal beneficiaries of the Public Health Service in order that their defects might be corrected.

5. That routine tests for syphilis be made on all registrants under the Selective Service Act at the time of their registration.

6. That the Public Health Service secure funds for the training of professional industrial hygiene personnel.

It is of interest to note here the extent to which these recommendations by the State health officers were met during the war. The emergency health and sanitation program of the Public Health Service derived from the first recommendation of the Conference and was carried out from March 1941 to July 1, 1946. The War and Navy Departments and the Selective Service System issued directives to their regional and local commands requiring compliance with State health laws in regard to sanitary facilities and the reporting of communicable diseases. The performance of blood tests on men at the time of registration was adopted by all the agencies concerned and became the largest case-finding program ever conducted.

The proposal that the Public Health Service accept for medical and hospital care men who were rejected because of physical defects was not adopted. Several other plans for correction of defects among registrants were advanced by numerous groups. The concept of rehabilitating men for war duty, however, was in some way repugnant to the American people. Neither the Congress nor the Administration felt that a broad program of this nature could advance the war effort. All our resources were needed for the Army and Navy. When actual war brought about total mobilization, the Army lowered its standards for physical fitness. Men were inducted both into the Army and the Navy and their physical defects were corrected by these agencies.

The demands for professional personnel in all categories for duty in the armed services resulted in broad training programs for physicians by the Army and the Navy; therefore, the recruitment and training of industrial hygiene personnel by the Public Health Service were not feasible on the broad scale proposed by the Conference. However, under the Emergency Health and Sanitation program, the Public Health Service was able to recruit approximately 200 industrial hygienists for duty in the States.

FUNDS FOR EMERGENCY HEALTH AND SANITATION

In accordance with the first recommendation of the Conference, Surgeon General Parran on September 19, 1940, submitted an estimate of $1,237,000 for emergency work in extra-military and defense industrial areas. The Budget Bureau refused this initial request on the ground that Congress had appropriated $11,000,000 under the Title VI and $6,000,000 under the Venereal Disease Control Act for grants-in-aid to the States. The Director of the Budget held that the States and localities had wanted the war industries to be located in their jurisdictions and had increased their tax bases in order to qualify; therefore, the States and communities should meet this problem with their presently available funds.

Few State legislatures were in session; and even had they been disposed to pass legislation for the assistance of the boom towns, delay until laws could be passed would have been disastrous, not only to the defense program but to the Nation's health. Realizing the urgent nature of

the problem, the Public Health Service, supported by the Advisory Commission of the National Defense Council and the newly established Office of Defense Health and Welfare Services, finally convinced the Budget Bureau that some relief must be afforded the communities.

The Urgent Deficiency Appropriation Act, approved March 1, 1941, included an item making available to the Public Health Service $525,000 for the remainder of the fiscal year, for health, sanitation and industrial hygiene activities in defense areas. The Act provided that this sum be expended:

> For all expenses necessary to enable the Surgeon General of the Public Health Service to assist State and local health authorities in health and sanitation activities (1) in areas adjoining military and naval reservations, (2) in areas where there are concentrations of military and naval forces, (3) in areas adjoining Government and private industrial establishments engaged in defense work, and (4) in private industrial plants engaged in defense work; and to provide emergency health and sanitation services in Government industrial plants engaged in defense work and in areas adjoining United States military and naval reservations outside of the United States; such expenses to include personal services . . . ; purchase, exchange, maintenance, and operation of passenger-carrying automobiles; stationery; travel; printing and binding; and items properly chargeable to the appropriation for miscellaneous and contingent expenses of the Public Health Service.

Thus, the Emergency Health and Sanitation appropriation came into being. These funds were not to be used as grants-in-aid to the State health departments, but were to be expended in the same manner that similar appropriations to the Public Health Service in World War I were expended; namely, by the employment and assignment of Public Health Service personnel to duty in emergency areas.

The critical situation with respect to health personnel was not fully met by the Emergency Health and Sanitation appropriation; but since the depletion of civilian personnel in State and local health agencies continued throughout the war, it is doubtful whether without the Emergency Health and Sanitation personnel, public health in the United States could have been maintained in World War II. Outside of the Commissioned Corps of the Public Health Service, no other health personnel in the Nation could surely be retained for civilian health work.

As the supply of State and local health personnel continued to decline, it became apparent by 1943 that the services provided by State and local

health departments in non-war areas were inadequate for the protection of the Nation's health. In the meantime, grants-in-aid, under Title VI, to the States could not be fully expended by the State health departments because they were unable to employ personnel. The National Advisory Health Council, and the State and Territorial Health Officers, had hoped that these funds might be utilized by employing reserve officers in the Public Health Service for detail to States requesting such use of their unexpected balances. The Service placed this proposal before the Budget Bureau in the Spring of 1943, and, on May 5, Mr. Harold D. Smith, Director of the Budget Bureau, ruled against such use of grant-in-aid funds. He held that the proposal actually required amendment to Title VI and such a change in basic legislation was not in accord with the President's policy.

The primary purpose of the Emergency Health and Sanitation program was to strengthen and preserve the civilian health services in war areas. As has been stated, the first problem was the provision of personnel for State and local health departments, whose staffs were already depleted and whose responsibilities were increasing rapidly.

SHORTAGE OF PUBLIC HEALTH WORKERS INCREASES

Recruitment of personnel was exceedingly difficult. Physicians, engineers, and dentists could be commissioned in the reserve corps, but until the Public Health Service Act of July 1, 1944, nurses and similar personnel were not commissioned. The Public Health Service also recognized that physicians in the younger age groups were in urgent demand by the Army and the Navy, and that such young physicians as it could recruit would have to be assigned chiefly to the Coast Guard, the Marine Hospitals, and other activities beyond the physical capacities of older men. Hence, in the recruitment of physicians for civilian health activities the Public Health Service lowered the physical standards for reserve officers and accepted for commission in the reserve corps men over 45 years of age. Thus, many able physicians, not acceptable in the armed services, were available to the Public Health Service. In the first two years of the war, however, the majority of physicians, engineers, and dentists recruited by the Public Health Service were younger men.

During the first year of the Emergency Health and Sanitation program, 700 health workers were recruited and assigned to duty in 42 States, three Territories and the District of Columbia. Nearly three-fourths were in local health departments in 216 critical war areas. The policy of the Public Health Service was to encourage State and local health departments to take over onto their payrolls the personnel assigned to them by the Service when vacancies occurred in their staffs. Although this was hazardous, since State and local health departments did not have employment priorities comparable with those of the Federal agencies and war industries, the policy was widely accepted by civilian health agencies. Many professional workers employed by the Public Health Service under Emergency Health and Sanitation appropriations obtained permanent positions on the staffs of State and local agencies.

Professional and technical recruits were assembled at Public Health Service Headquarters in Washington before assignment to District Offices, and thence to State and local health departments. The first four to six weeks were devoted to an orientation course, in which the recruits received instruction in the activities of the Public Health Service, administrative procedures pertinent to their employment, and some indoctrination in general public health administration. At first, the orientation plan included temporary assignment to a State or local health department for two to four weeks of practical training in public health. In this assignment, Public Health Service personnel received supervised practice in various activities related either to general public health programs or to special programs such as venereal disease control and industrial hygiene. As the demands for professional personnel increased and the supply decreased, this plan proved impracticable. By the close of 1942, it had been abandoned and personnel were assigned to the field in which they would operate immediately after orientation at Headquarters.

The value of the orientation course and the practical training plan was proven in the field. The majority of the professional workers, especially the physicians and the engineers, had had no training or experience in public health work. The high quality of work which they did in the field, the services they rendered to civilian health during the war,

attest not only the value of the brief indoctrination they received, but even more, their personal qualifications and devotion to duty.

Fifteen orientation courses in all were conducted between April 1941 and July 1944. Nearly 1,000 persons attended and were assigned to the States. They included 317 engineers and sanitarians, 315 physicians, 230 nurses, and 74 dentists, health educators, and laboratory technicians. This group does not include all the professional and technical personnel employed by the Service under the Emergency Health and Sanitation appropriation. Hundreds of men and women had to be employed and rushed to the field without benefit of training. Moreover, the great majority of the persons employed under this appropriation were clerical and administrative personnel, and laborers employed for malaria control work. These classes of personnel were usually recruited in the field either by District Offices or field stations of the Public Health Service, or by State and local health departments.

The total of the Emergency Health and Sanitation appropriations to the Public Health Service from March 1941 to June 30, 1946, was nearly $40,000,000.* The peak was reached in the fiscal year 1945, with an appropriation of $12,250,000, most of which was allotted to malaria control activities.

The Evacuation of the Japanese from the West Coast

Following the attack on Pearl Harbor by the Japanese in December 1941, it was decided as a military measure to evacuate all persons who had as much as one-fourth Japanese blood from the West Coast in the spring of 1942. This involved the movement and concentration of approximately 110,000 people of both sexes and of all age groups and presented a public health and medical problem of considerable magnitude. The Western Defense Command of the United States Army was under the direction of Lieutenant General John L. DeWitt. An Executive Order (No. 9066) issued by President Franklin D. Roosevelt on February 1, 1942, authorized the Commanding General of the Western Defense Command to use any Federal agency to assist in expediting

*March-June 1941, $525,000; fiscal year 1942, $4,470,000; 1943, $9,702,000; 1944, $10,733,000; 1945, $12,250,000; 1946, $2,300,000.

the evacuation. Medical Director Walter T. Harrison, in charge of the Public Health Service District with Headquarters at San Francisco, was requested by General DeWitt to make available the resources of the Service and to assume charge of medical and public health services to the evacuees until they were delivered to the proposed detention or relocation camps then in the planning stage. The costs of employing additional physicians and nurses and of purchasing medical and surgical supplies were paid by the Army.

The plan of the evacuation was devised and carried out by the Wartime Civil Control Administration which was under the direction of the U. S. Army. The services of the United States Employment Service and Public Assistance Bureau of the Social Security Board, both parts of the Federal Security Agency, the Federal Reserve Bank and the Farm Security Administration were utilized. Civil control stations were established for the registration and processing of the Japanese. From these stations the evacuees were transported to assembly centers. They remained at these centers until the relocation camps had been constructed and established in which they were held for the duration of the war. Any family or individual who made satisfactory arrangements for employment and living conditions in another part of the country was released from either an assembly center or a relocation center at any time. The relocation camps were administered by the War Relocation Authority, under the direction of the Department of the Interior.

The policy of the United States Government with respect to the health of the evacuees was to safeguard the health of the well, to prevent the spread of communicable diseases, to provide the best medical care for the sick, and to protect the sick and aged at each stage of the migration. All medical and institutional care required by the Japanese after an area had been posted was provided at Government expense.

In carrying out these policies the Public Health Service called upon State and local health departments and private physicians in California, Oregon, and Washington, for assistance. Complete cooperation was received. Fourteen physicians and 20 nurses from local communities participated in the activities in addition to the medical officers and nurses of the Public Health Service assigned by the District Office in San Francisco.

Prior to the evacuation each individual was given a medical inspection to detect the presence of communicable diseases and of other conditions making them eligible for exemption. Except for a widespread outbreak of measles, the disease most frequently discovered at the time of inspection was pulmonary tuberculosis. The examinations were made at the civil control stations a day or two before entrainment for assembly centers. Japanese who were ill at home on the day of the examination were visited by a physician. Those in hospitals were exempted upon certification of the attending physician, or of the hospital. If the trip from the civil control station to the assembly center was short, the medical inspections were conducted at the center. A physician and nurse accompanied every train or bus convoy and, if persons became acutely ill en route, they were removed from the train and placed in a hospital.

Many of the tuberculous and mental patients were in institutions and were not disturbed. In southern California a number of mildly insane cases were found in the homes. Dr. Arthur Will, Superintendent of Los Angeles County Hospital, was especially helpful in assisting with such cases.

Pregnant women in the eighth or ninth month of pregnancy were not allowed to travel in evacuation convoys. They were excepted until after they were delivered and they and their babies were able to travel. At the time their families were evacuated these pregnant women were admitted to public hospitals and nursing homes as ambulatory patients. In a few cases where no public hospitals were available, another member of the family was exempted to care for the pregnant woman in her home. Children with measles, mumps, and other acute communicable diseases of childhood at the time of inspection were also placed in public hospitals until they were able to travel. The United States Army provided special travel accommodations, usually Pullman car space, for persons convalescing from serious illness and for the senile individuals.

HOSPITALS ESTABLISHED AT ASSEMBLY CENTERS

The Public Health Service set up and supervised hospitals at the four largest assembly centers, Manzanar, Santa Anita, Pomona, California; and Puyallup, Washington, and supervised infirmaries at the

smaller centers. Officers of the Service assisted the Engineer Corps of the Army in selecting sites for the hospitals.

The hospitals and infirmaries for evacuees were staffed by Japanese personnel. The physicians, dentists, and nurses were selected by the Public Health Service and assigned to specific centers prior to the reception of other evacuees. At the time of the evacuation the ratio of Japanese physicians to evacuees in the communities was one to 2,000. The shortage of Japanese doctors created problems in distributing them equitably in the several assembly centers. The shortage of nurses was more acute. A number of Japanese physicians and nurses in the eastern part of the United States voluntarily entered the assembly centers in order to help care for their people. Fourth-year medical students and interns were assigned to hospitals and infirmaries to assist the physicians while student nurses and aides were put on duty to relieve the trained nurses. There were no deficiencies of dentists, pharmacists, and laboratory technicians among the Japanese.

At each assembly center a Japanese physician was placed in charge of the hospital or infirmary and of the entire professional staff in the center. He was responsible for the medical care of the population in the center and for the equipment and supplies. He was under the direct supervision of officers of the Public Health Service or their representatives. Because of the shortage of Japanese physicians, it was not possible to place a specialist in each branch of medicine and surgery at each center. The Public Health Service, therefore, made arrangements with specialists from nearby communities to act as consultants to the Japanese medical staffs.

ASSISTANCE GIVEN BY LOCAL HEALTH AUTHORITIES

The county health officers accepted the responsibility of acting as health officers for the centers within their jurisdictions and as representatives of the Public Health Service in the supervision of the hospitals and Japanese staffs. These responsibilities of the county health officers included control of communicable diseases, registrations of births and deaths, organization of maternal and child health clinics, venereal disease and tuberculosis clinics, and general sanitation of the center. The facilities and procedures within the centers were required to meet

Federal, State, and local sanitation standards. Japanese physicians cooperated with the health officer in making sanitary inspections. They submitted regular reports to him. He, in turn, dealt with the managers of the assembly centers to insure correction of insanitary conditions.

The regular staffs of the county health departments carried on this work along with their normal duties. At Santa Anita and Pomona, California, each with between 12,000 and 15,000 evacuees, the Public Health Service assigned to the county health department a physician, two public health nurses, and a sanitarian who formed a full-time public health staff and who had their offices in the center. One of the first tasks of the Japanese medical staffs was to vaccinate all evacuees against smallpox and immunize them against typhoid fever. Later, children were immunized against diphtheria and whooping cough.

While the 110,000 Japanese evacuees were in the assembly centers, no serious epidemics occurred. Epidemics of German measles and measles were current in California at the time of the evacuation. Inevitably, some of the children among the evacuees came down with one or the other of these diseases. The peak at any center at one time was 58 cases of measles, at Santa Anita.

When the relocation camps were ready, a second mass transfer of evacuees began. About 225 special trains were required to complete this transfer. The Public Health Service was responsible for the medical care of the Japanese en route from the assembly centers to the relocation camps. Without the wholehearted cooperation of private physicians and nurses, it would not have been possible to have a physician and nurse on each train. The assembly center at Fresno, California, was the last to be closed. On October 30, 1942, the last trainload of Japanese residents of the Pacific States left for Tule Lake and the participation of the Public Health Service in this activity ceased. In November, Japanese evacuees from Hawaii began to arrive in San Francisco in groups of about 500 each until April 1943. The District Office of the Public Health Service at San Francisco assisted with the transfer of these evacuees to war relocation camps by selecting physicians and nurses to accompany the trains and render the required professional services.

The medical phases of the evacuation of the Japanese from the West Coast were under the general direction of Medical Director Walter T. Harrison of the Public Health Service. The early responsibility for the construction and staffing of hospitals and infirmaries was handled by Dr. John N. Bowden. In the latter stages of the hospital construction and staffing, Dr. C. Benjamin Spencer and Dr. F. Paul Burow handled the work. Dr. Thomas B. McKneely assisted in staffing, equipping, and getting the infirmaries and hospitals in operation. In the early period of inspection of the Japanese, and in arranging for transportation of evacuees to assembly centers, southern California and Arizona were handled by Dr. Charles F. Blankenship. Dr. Raymond F. Kaiser handled northern California and also had the responsibility of providing medical and nursing services on all evacuation trains. Dr. Erwin C. Drescher handled Oregon. Dr. Thorburn S. McGowan was responsible for the State of Washington.

Community Facilities for Health

One of the central facts revealed at the outset by the reconnaissance surveys made by the Public Health Service prior to World War II was the inadequacy in war areas of the physical facilities to maintain health, safe public water supplies, sewage disposal and sewerage systems, hospitals, and health centers. Even facilities for good municipal housekeeping, garbage and refuse disposal, were not adequate.

Health and medical authorities in the United States had recognized the deficiencies for some years before World War II. Many small and medium-sized cities were deficient in the provision of basic sanitary facilities and hospitals. The villages and the countryside where military establishments and war industries were to be constructed had nothing. Yet the towns were to spring up in these areas almost overnight, and the cities which had made adequate, or almost adequate, provisions for their peacetime populations were shortly to become critical war areas. The capacity of existing facilities to serve these communities was to evanesce as some 30,000,000 Americans joined the great wartime movement of population, soldiers, sailors, marines and their families, and the people who conduct commercial establishments serv-

ing civilian communities. Community facilities of all kinds had to serve not only new residents but also a larger and equally demanding transient population.

Many States, cities, and communities probably could have expanded their health facilities without assistance, but the majority of those seriously affected by the war could not do so. The war demanded extraordinary measures in the civilian health field, just as it demanded extraordinary measures to arm the nation and our allies for defeat of the enemy. Legislation to provide Federal assistance in war areas was needed and was made available by the 77th Congress early in 1941.

Two important pieces of legislation, the Lanham Acts, were enacted by Congress in February and June 1941. The Lanham Acts bear the name of their sponsor, the Honorable Fritz G. Lanham of Texas, Chairman of the House Committee on Public Buildings and Grounds. The first of these Acts provided for the construction, maintenance, and operation of defense housing; the second, for the construction, maintenance, and operation of community facilities in war areas. Both had provisions closely related to civilian health and to the work of the Public Health Service in World War II. President Franklin D. Roosevelt, on February 24, 1941, transmitted a message to Congress on community facilities under national defense. The President's message fully defined the need for Federal assistance in the provision of community facilities in defense areas and proposed means for meeting these needs.

The Community Facilities Act was approved on June 28, 1941. It made available to the Federal Works Administration $150,000,000

> . . . to provide means by which public works may be acquired, maintained, and operated . . . in any area or facility where the President finds an acute shortage of public works necessary to the health, safety, or welfare of persons engaged in national defense activities.

The facilities authorized by the Act included schools, waterworks, works for the treatment and purification of water, sewerage, sewage disposal, garbage and refuse disposal, public sanitary facilities, hospitals, and other places for the care of the sick.

Under the regulations of the Federal Works Agency, in an agreement with the Office of Defense Health and Welfare Services (later

called the Office of Community War Services) and the Public Health Service, communities requiring such facilities made applications to the Federal Works Agency. The appropriate war agencies, chiefly the Army and the Navy, were required to certify as to the defense need of the project; that is, facilities secured under the Lanham Act had to be directly related to a defense activity. Projects relating to health or sanitation, such as water supplies, sewage disposal, hospitals, health centers, and the like, had to be cleared through the Public Health Service. At the time the Lanham Act was passed, the Public Health Service had a vast amount of information on defense areas accumulated during the preceding year through the reconnaissance surveys.

Administration of Lanham Act Funds

Broadly speaking, the funds of the Federal Works Agency would be used for construction, purchase, rental, or renovation of community hospitals, nurses' quarters, and health centers, maintenance and operation of these physical facilities for a limited time, except for such maintenance and operation costs as would be provided by the Public Health Service. These funds were also used for costs of building maintenance and operation of community facilities, construction and operation of water supply and sewerage systems, and community sanitation projects, such as garbage and refuse disposal, except the construction of sanitary privies.

The Public Health Service was responsible for aid in providing maintenance and operation costs for community health facilities not constructed or acquired with Lanham Act funds and for all services rendered by all health centers, the extension of State and local services because of war-connected needs, the training of nurses and other public health personnel, and assistance in financing public medical care in war areas where acute shortages of medical personnel existed.

The Federal Public Housing Authority, soon after the passage of the Defense Housing Act, recognized the close relationship of health services and facilities with housing projects. The Public Health Service and the Federal Public Housing Authority were brought into close working relationship because of the engineering problems relating to

healthful houses and the problem of making available health and medical services to the residents of housing projects. The Public Health Service was requested by the Federal Public Housing Authority on May 6, 1941, to assign personnel to advise the War Housing Authority on the medical needs in war housing areas. The task at hand was to estimate needed hospital and infirmary facilities for the housing projects, as well as for medical, dental, and public health services for the various projects.

The Public Health Service had no responsibilities for the certification of need for defense housing. Because of the close cooperation of the Service with the Federal Public Housing Authority, however, much of the data on housing problems in war areas collected in the reconnaissance surveys was utilized by the Housing Authority.

Assistance was given the War Production Board in determining priorities for the purchase of health and medical facilities, equipment, and supplies, as well as with respect to priorities for the construction and operation of sanitary facilities, such as water supplies, sewage disposal, and sewerage systems.

In August 1941, a Hospital Facilities Section was established for the purpose of maintaining liaison with the special units of the Federal Works Agency and the War Production Board. Dr. Vane M. Hoge was placed in charge of this Section. This Section was concerned with certification of need for construction or procurement of hospitals, health centers, and related facilities, and served as consultant to the Federal Works Agency in its medical facilities and services program. The establishment of standards, the planning and designing of hospitals and health centers were a part of its functions. Assistance was given in furnishing infirmary and medical services to war public housing tenants. Recommendations of priorities for civilian construction and equipment to the War Production Board were also handled by this office.

Hospitals and Medical Care

With the concentration of troops for training and the development of war industries in many areas, an unusually heavy burden was placed upon the hospital facilities of numerous communities of the nation during the war, especially in the smaller cities and towns.

The lack of hospital beds in war areas could not be fully met during the emergency. Even though Federal funds were available for constructing the most urgently needed facilities, many factors contributed to the failure to meet all needs. Chief among these were: (1) the deficiencies in hospital beds which had accumulated in all parts of the country before the war; (2) the necessary restrictions on construction and material and equipment during the war; (3) labor shortages in every category of workers for civilian purposes; and (4) the acute shortages of professional personnel, notably of physicians and nurses.

Perhaps more than any of the other health activities conducted during the war, the hospital construction program revealed the two links in the chain of civilian health services that are unbreakable—facilities and personnel. The depletion of professional and ancillary personnel in the medical and public health fields undoubtedly affected scientific research, health services and civilian medical care, but in those fields it was possible to carry on with insufficient personnel and makeshift facilities. It was impossible to give hospital care without hospitals, and it was impossible to operate hospitals without nurses, physicians, and technicians.

The program for the construction of hospitals in war areas provided a practical demonstration that Federal aid was important to the expansion of hospital facilities in the United States, a fact that had been established statistically and embodied in recommendations of health and hospital authorities before the war. The ominous shortage of personnel in all categories and the virtual collapse of training institutions following the war were not so clearly predicted as were the needs for hospitals and health centers. Hence, in the first two years immediately following the termination of active fighting, plans had not been formulated for solving the larger, more complex problem—the recruitment and training of personnel.

Mosquitoes, Fleas, and Other Pest Enemies

MALARIA CONTROL IN WAR AREAS

Of all the diseases transmitted to man by insects and animals, malaria was to present the most serious threat to civilian and military health,

both in the United States and abroad during World War II. Experts had predicted a cyclic upswing of malaria infection in the United States during 1941. Military and industrial mobilization, begun in 1940, could be expected to accelerate the predicted increase as thousands of persons moved into malarious areas and as interstate traffic grew to unprecedented volume.

The experience of the Public Health Service during World War I and the succeeding years showed that extraordinary measures would be needed to protect troops in malarious areas and to avoid outbreaks in the civilian population. The cooperative program of the Public Health Service, State health departments, and the Work Projects Administration could not provide this protection; for by spring of 1941, the WPA could not secure the necessary labor. Funds requested by the Public Health Service to operate an adequate malaria control program in defense areas during 1940-41 were denied by the Budget Bureau and the Congress on the ground that WPA projects could meet the needs.

Most of the training camps and maneuver areas were to be established in the South, as were many other important military installations. To assist the Army in solving the problems of malaria control within these establishments, the Public Health Service, in the spring of 1941, detailed its chief malariologist, Dr. Louis L. Williams, Jr., as liaison officer to the Headquarters, Fourth Service Command of the Army, Atlanta, Georgia. The majority of the malarious areas of the United States were included in the area covered by this Service Command. Doctor Williams drafted the plan of field organization for malaria control in military areas and assisted in the formulation of military policies for control. The Public Health Service also employed a few engineers and assigned them to duty in certain State health departments to assist with malaria control in defense areas. Thus, in 1941, with no funds or authority for effective organization, the Public Health Service did what was possible to afford the protection which it knew was necessary in the extra-military zones.

MALARIA CONTROL BEGINS

Faced with this situation and backed by strong requests for action from the War Department, the Public Health Service obtained, in 1942,

an appropriation to operate an independent program for malaria control in war areas in the 15 southeastern States, Puerto Rico, the Virgin Islands, and other Caribbean areas controlled by the United States. The office established in the States Relations Division to administer the program was entitled "Malaria Control in War Areas" (MCWA), and early in 1942 headquarters were set up in Atlanta, Georgia. Doctor Williams was assigned to head the unit, assisted by Mark D. Hollis, Harry G. Hanson, and Wesley E. Gilbertson, sanitary engineer officers. Later this unit was joined by Stanley B. Freeborn, an outstanding medical entomologist.

The policy adopted was to undertake operations only where the prevalence of malaria-transmitting mosquitoes constituted a malaria transmission hazard. Mosquito-free zones of one-mile radius (the flight range of the *Anopheles quadrimaculatus*) were set up and maintained around each military and war industrial establishment. To attain this objective minor drainage and larviciding were required in most instances; in special cases major drainage was undertaken.

Prior to the war a basic plan for malaria control had been worked out which incorporated the specialties concerned with the control of malaria—medicine, engineering, and entomology—in a single control team. By focusing the attention of these three specialties upon a threatened area, the human hosts can be located, the prevalence of vectors determined, their breeding places discovered, and control measures applied. This concept was followed both by Doctor Williams in the organization of the Office of Malaria Control in War Areas and by Mr. Hollis who succeeded him as officer in charge in 1943. Medical, engineering, and entomology divisions were set up under the leadership of Dr. Trawick H. Stubbs, Nelson H. Rector, a sanitary engineer, and George H. Bradley, an unusually able entomologist.

Even though the specific mosquito vector of malaria, *Anopheles quadrimaculatus,* had been well known for some years, most malaria control operations continued to be directed against the general mosquito population. A fundamental determination was made at the beginning of the MCWA program that operations would be focused on the specific vector of malaria. Such selective control measures were made possible by utilizing entomologic survey and inspection services to the fullest extent

consistent with efficient management. This procedure reduced the central costs an estimated 15 million dollars during the war.

The major activity in the MCWA program from March 1942 to September 1944 was the application of established anti-anopheline measures, namely, larviciding, draining and filling of watered areas. The magnitude of the operations, which surpassed anything previously known, the necessity to obtain results speedily with limited funds, and the wartime shortage of personnel, combined to stimulate the development and use of improved modern equipment and materials including DDT when it became available.

During the period of maximal military training and industrial production, malaria control drainage, filling, and larviciding were accomplished by this organization around approximately 2,200 localities of military concern in 19 different States. Through 1945, these activities included the clearing and cleaning, incidental to larviciding, of 37,000 watered acres and 96,700,000 linear feet of ditches; the use of 5,700 gallons of oil and 73,000 pounds of Paris green in larviciding 660,486 acres; the installation of approximately 10,900,000 linear feet of drainage ditch of varying cross-section (90 percent of this work was by hand labor, five percent with dynamite, three percent by heavy machinery, while the other two percent were lined or tiled ditches); and the use of mechanical and hydraulic methods for making 315,000 cubic yards of fill. Highly mechanized equipment, including 50 boat and truck-mounted high pressure sprayers and 12 oil-water centrifugal pumps, were used on the program. In 1944 power dusters were used to treat 55 percent and airplane dusting was used on 34 percent of the acreage dusted with Paris green.

When MCWA was established in March 1942, the American people had their thoughts on problems far away from home. Bataan and Corregidor were falling and the country already knew that malaria was helping the enemy by disabling and killing American men and their Philippine allies as they fought the desperate losing battle. Few realized, however, that malaria was to become the number one military disease. And fewer still would have believed that within a year health authorities and plain citizens alike would be calling for drastic measures to keep "infected troops" out of civilian communities lest these men, returning

home from combat, transmit malaria or some other tropical disease to their safe and comfortable fellow citizens.

On April 27, 1943, a joint Inter-Service Committee made specific recommendations for the prevention of outbreaks of malaria from this potential source. At that time the number of cases of malaria in hospitals had increased sharply and the importation of prisoners-of-war, many of whom were infected, added to the problem. To meet this threat mobile units manned by two to five men were employed to handle inspection, larviciding, mosquito control within buildings, and incidental land drainage wherever deemed necessary.

ACTIVITIES IN CIVILIAN AREAS

Although the malarious area of the United States was substantially reduced by the close of 1944, there were still 120 counties—all in the South—where malaria remained a critical problem. It was feared at this time that a return to critical areas of large numbers of malaria carriers might cause the reversal of the downward trend of the disease.

DDT INTRODUCED

At the same time much work had been done toward the perfection of the use of DDT as an insecticide. This combination of events presented an opportunity, perhaps never to be offered again, for knocking out malaria in the United States with one quick blow. Such a goal appeared attainable by treating houses with a formulation of DDT which, when mixed with water to form a spray, would adhere to walls, furniture, and other surfaces, and retain its insecticidal property against anopheline mosquitoes for long periods. Nearby breeding places could be larvicided concurrently to strengthen the attack.

Most of the 120 counties mentioned above were rural communities in which no war activity had been established and in which MCWA had no jurisdiction. Nevertheless, the proposal to extend the MCWA program to these highly malarious areas was endorsed by the State and Territorial Health Officers, the Bureau of the Budget, and a supplemental appropriation of $1,600,000 was approved by Congress to finance the program for the first six months of 1945. Participation by State and local health departments was forthcoming and Public Health Service

personnel were assigned to the States to assist in the DDT spraying, larviciding, and minor drainage in the selected areas. MCWA also provided intensive training in malaria control for State and local personnel and developed a community education program to secure cooperation of families whose homes were to be sprayed, and to dispel the fears of those who were unduly alarmed about the return of demobilized malaria carriers.

Careful evaluations of morbidity and mortality statistics led to the selection of all or parts of 68 counties in nine southeastern States for initiation of control operations. As time passed, operations were expanded to include other less important foci of the disease. In 1946, plans called for programs in 188 counties in which nearly a million homes were to be treated.

With the termination of hostilities, Federal programs connected with the war were gradually liquidated, and as a result one million eight hundred thousand dollars was rescinded from the Public Health Service appropriation for the control of malaria and diseases of tropical origin. There now began, as an outgrowth of MCWA, a series of lectures and demonstrations by Public Health Service teams on the use of the "magic" DDT against household insects other than mosquitoes. Pest insects such as flies, roaches, bedbugs, and fleas were the targets in dairies, pasteurization plants, rooming houses, kitchens, and hospitals. DDT formulae and equipment, and ways to use them were explained to audiences who had special interest in pest control. Health departments were provided with equipment and supplies and encouraged to extend the demonstrations. Dr. John A. Rowe, MCWA entomologist assigned to the District office of the Service in Kansas City, was particularly active in organizing work of this type.

The beneficial results of the impact of public health activities are measured, in the long run, by decreased illness and death. While it may be too early as yet to clearly define all of the results of the intensive malaria control work during World War II, it is a matter of record that the incidence of malaria infection contracted in the United States dropped sharply during that period, and the mortality rate for malaria, including members of the armed forces and ex-servicemen, declined in each of the war years and in 1944 was less than half that in 1941. When

it is considered that 2,000,000 ex-servicemen who had acquired malaria overseas dispersed to all parts of the United States, the record is phenomenal. Also, it may be stated that throughout the war, the U. S. Army reported the lowest incidence of malaria in its history among troops based in the United States in spite of the fact that, in his Army service, probably every soldier was stationed for a longer or shorter period in a malarious area.

BY-PRODUCTS OF PROGRAM

Often the by-products of a defensive public health program carried on in an emergency have a more permanent effect than do the accomplishment of the specific tasks. In the multitude of problems connected with mosquito control the officers assigned to the program developed a high degree of effectiveness in teamwork and skill. They advanced scientific development in this field by their willingness to test and employ every available old and new technique. MCWA operations constituted the largest demonstration of mosquito control ever attempted in the United States. Through its emphasis on training all classes of operating personnel, MCWA provided many communities with skilled workers capable of carrying on successful control work. Permanent improvements made in the elimination of mosquito-breeding waters not only protected large population groups but also increased the economic value of the land. If for no other reasons than the foregoing, the MCWA program may have more than justified the money, labor, and skill devoted to it, not to mention the fact that its activities, combined with those of the Army and Navy in military establishments achieved its principal goal, the substantial protection of millions of people from malaria.

PUERTO RICO

At the beginning of World War II, Puerto Rico presented in microcosm a total malaria control problem. Its malaria rate, one of the highest in the world, was associated with a traditionally low economic level. In contrast to MCWA organizational procedures in the States, a formal agreement was made with the Insular Health Department, whereby MCWA assumed full responsibility for the administration of operations for the benefit of the armed forces on the Island. These numbered be-

tween 200,000 and 300,000 men. By this arrangement, the Insular Health Department was free to devote its resources to combating malaria in the civilian population. The MCWA program on the Island was closely coordinated with Army and Navy activities and was carried on effectively by John M. Henderson, sanitary engineer in charge, who had as his principal assistants, Arthur H. Neil and Porter A. Stephens, engineer officers, and Harry D. Pratt, entomologist officer.

In 1941, the death rate from malaria in Puerto Rico was 122.8 per 100,000 population. Case rates among Army personnel during the rainy season of 1941 were alarming, ranging from 100 to 320 per 1,000 per month. With the arrival of the Public Health Service group in San Juan early in March 1942, large scale anopheline larviciding was ordered in and around the military establishments to relieve the dire situation. Even though submarine warfare was taking a heavy toll of shipments from the Continents and strict priorities were in force for all except military cargoes, urgently needed supplies and equipment were obtained through the intervention of the Surgeon of the Antilles Department of the Army. An early survey revealed not only that the camps were poorly located, but also that in most cases scant attention was being paid to elementary malaria control measures such as mosquito-proofing of barracks, and the use of bednets and insecticides. As a result of the survey, Colonel John Milton Ferry, U. S. Army Corps of Engineers, was assigned to the Antilles Department as malaria control liaison officer, and a Malaria Board composed of members of the Army, Navy, Public Health Service, and Insular Health Department, was created to provide consultative services to post commanders and to the Antilles Department Headquarters. Army posts soon were ordered to institute mosquito control measures including the screening of all housing facilities, the use of bednets and insecticides. The results of these measures combined with the antianopheline activities soon were clearly evident. During 1944, Puerto Rico's malaria death rate had fallen to 49.2 per 100,000, and by 1945 the monthly case rates at several military posts were being maintained at 6 per 1,000 or better throughout the year.

QUARANTINE PROBLEMS

From the outset of World War II, the direct threat of introduction of disease through southern airports of the United States, both military

and civilian, was given consideration. On the one hand, in many large South American cities *Aedes aegypti* had yielded to the long-continued eradication efforts of the National Yellow Fever Service of Brazil and the Rockefeller Foundation. On the other hand, the vector of this dread disease and of dengue was prevalent in southern cities which had been free of yellow fever for many years. The problem was of concern to the Foreign Quarantine Division of the Public Health Service, which was charged with keeping "stowaway" mosquitoes out of the United States and with isolation of infected persons. It was not charged with eradicating the yellow fever vector in port cities. It was logical, therefore, that MCWA should join with the Foreign Quarantine Division in a cooperative plan for dealing with this situation. Arrangements were made whereby small groups of workers trained to control yellow fever and dengue epidemics were placed at strategic ports where they worked to prevent the export and import of disease vectors. They also constituted teams available for swift transfer to nearby ports to combat any outbreak. Mosquito-free zones were established around each international airport of entry in the threatened area. Every building within these zones regularly was sprayed and inspected. Active cooperation of the local health departments assisted in reducing the prevalence of *aegypti* mosquitoes in the community at large.

Toward the end of the war in 1945, MCWA trained municipal sanitary inspectors of port cities in *Aedes aegypti* inspection, and at the same time the *Aedes aegypti* inspectors were trained in general sanitation. As a result, a corps of trained *aegypti* inspectors was established in each of the cities for use in any future emergencies.

DENGUE IN HAWAII

On July 24, 1943, two cases of dengue were reported to the Territorial Board of Health as originating in the Waikiki district of Honolulu, famed rest and recreation center for 2,000,000 American GI's on their way in and out of the war against Japan. Epidemics of dengue had occurred in Honolulu in 1903 and 1912 and had run their course, affecting a large proportion of the population. Two vectors of dengue were prevalent in Hawaii—*Aedes aegypti* and *Aedes albopictus*. En-

vironmental conditions were ideal for their propagation, and the Hawaiian ways of life and work increased the ease with which insect-borne diseases could be transmitted.

The Territorial Health Department immediately began preventive measures, and the Honolulu Chamber of Commerce allocated its entire public health fund of $40,000 to fight against a possible dengue epidemic. By August 8, 40 cases had occurred among civilians in the Waikiki district, and the Army and the Navy declared Waikiki "off limits" for military personnel. Before the end of August, the disease was spreading at the rate of 50 or more cases per week.

At the request of Dr. Charles L. Wilbar, Jr., Territorial Health Officer, the Public Health Service assigned Wesley E. Gilbertson, a sanitary engineer, and R. L. Usinger, an entomologist, both Service officers, to Honolulu on September 1, 1943, with instructions to control the epidemic. They went without equipment or materials but with considerable "know how." With men, equipment and materials supplied by the Army, Public Health Service, and the Office of Civilian Defense, a control unit soon was organized. All premises in the city were inspected. Breeding places were treated routinely every 10 days. A rapid entomologic survey conducted in the first month of operations revealed the fact that *Aedes albopictus* was the principal vector and that these mosquitoes bred chiefly in the water-storing plants of the islands. Every conceivable water container needed treatment, notably the "ant cups" used by housekeepers to combat another pest, and tin cans, bottles, flower pots, tanks, paper boxes, and old automobile tires. The Territorial Health Department's Bureau of Communicable Diseases had the responsibility to follow up cases, confirm diagnoses, and institute isolation techniques. Inter-island quarantine was tightened. Spraying techniques for military and commercial planes were improved. "Clean-up" campaigns were launched and thousands of loads of tin cans, bottles, old tires, and other water containers were hauled away. The Army continued to assign personnel for this duty. Two sanitation companies were trained in Honolulu and then detailed to the islands of Kanai, Maui, and Hawaii to prevent spread of the epidemic there. At the peak of the epidemic, 400 soldiers were detailed to control activities in 50 communities.

OUTBREAK CONTROLLED

The results of the program proved its success. Reported cases in the Honolulu epidemic involved less than one percent of the civilian population. In uncontrolled epidemics the cases usually involved from 50 to 75 percent of the population. The infection never gained a foothold outside of Honolulu, either on the island of Oahu or on the other islands. Less than 50 cases originated among military and naval personnel from sources of infection in Honolulu.

TRAINING PROGRAM

Of the 260 commissioned officers assigned by the Public Health Service to MCWA, less than 10 percent had specialized training or experience in malaria control. Prior to MCWA all personnel recruited for this work were given an intensive orientation course of four to five weeks, most of which was given at Norfolk, Virginia, in cooperation with the Virginia State Health Department. Each formal course included lectures, laboratory exercises and field practice in control operations.

Training in malaria control was transferred to MCWA in 1942, and by May 1943 an in-service training and orientation unit to become known as the Training Division was established in MCWA headquarters. This was staffed by Dr. William S. Boyd, Lawrence B. Hall, a sanitary engineer, and Herbert C. Knutson, an entomologist. The work and organization of the Public Health Service; medical, engineering, entomological, and administrative aspects of malaria control; and of *Aedes aegypti* control were studied intensively.

As a result, trainees acquired confidence in themselves and enthusiasm for their jobs, and were able to carry out large diversified field operations without a serious failure. The MCWA training program also soon was serving other Public Health Service units and State and local health departments in the training of personnel to relieve wartime shortages. During 1944, six-weeks' courses of training in laboratory diagnosis of parasitic diseases were given to technicians from State laboratories, hospitals, universities, and private laboratories.

Early in 1946 a cooperative public health internship training program with the Savannah-Chatham County Health Department was administered by MCWA. This consisted of a practical course of field training

for health officers, sanitarians, public health nurses, and other personnel of local health departments. At the close of the fiscal year 1946 this type of service to State and local health departments was planned for training centers located in other parts of the country and administered by the newly formed Communicable Disease Center in Atlanta.

TYPHUS CONTROL

The common factor in the spread of bubonic plague and murine typhus is the rat. In August 1941, a conference of health officers from 12 western States reported to Surgeon General Parran the dangers inherent in the eastward spread of rodent plague and proposed that the Public Health Service organize and administer a program to combat the rat. The plan called for a large expenditure of Federal funds in order to establish around each threatened city a rat-free zone to act as a barrier against the transmission of rodent plague to city rats and thence to the human population. The disruptions associated with the mobilization then in progress and the war soon to follow could be depended upon to increase the spread of plague and typhus. For this reason, additional funds were allocated to the Plague Control Laboratory in San Francisco with which to strengthen its service to western ports and extra-cantonment zones; and in May 1942 an office of typhus fever control was set up in Atlanta, Georgia, under Dr. Clifford R. Eskey, who with John S. Wiley, a sanitary engineer, was charged with assisting the States in expanding rat-control work in communities where typhus was endemic. In 1945, this office was transferred to MCWA. The basic plan presented to municipalities was the adoption of a model rat control ordinance to be enforced by the local health department.

RODENT CONTROL

Sixty-one communities in 11 southern States and Puerto Rico received assistance from the Public Health Service and adopted rat control ordinances. By 1946, all of these communities had taken over the demonstrations. In the West, most of the ports already had rat control ordinances, but further progress was needed; during the war, no additional western cities took the steps necessary to establish a rat control program.

The war saw no improvement of rat control activities. The Public Health Service had only a very small staff available for that activity,

and State and local health officers, hard-pressed for funds and personnel, were not inclined to seek new responsibilities. Rat control and garbage disposal became municipal "housekeeping" functions and too often political plums awarded to private contractors. During the war period many cities went through episodes which centered about the garbage problems. Newspaper campaigns and political platforms resounded with the urgency to do something.

During the war the Public Health Service carried on plague control work on the west coast. San Francisco, Oakland, Berkeley, and Richmond, California, reported plague-infected rats; and a plague epizootic occurred among rats in Tacoma, Washington. Dr. Newton E. Wayson, Director of the Plague Control Laboratory, reported the facts to the State authorities, and the Public Health Service was requested to conduct a rat control program in the affected areas. No cases of human plague acquired from domestic rats occurred during this period.

Outbreaks of plague in the Hawaiian Islands brought assistance from the Public Health Service. In 1944, two Service engineers—Kaarlo W. Nasi and Bernard B. Berger—were assigned to the Hawaiian Health Department to work on the problem and assisted the sanitation personnel of the Army and the Marines in initiating rat control work. At a field laboratory set up in the plague area, rats, fleas, and mice collected by trappers were examined daily to determine specific areas of infection. Poisons were distributed in the sugar cane fields to reduce the rat population and thus minimize exposure of the workers during the harvest. In the first year of the combined medical and engineering attack on plague only two cases occurred in the island of Hawaii and in the last half of 1945, none. Although many factors were associated with this reduction in human and rodent plague, it was concluded that control of human plague depended as much on ratproofing of human habitations along with anti-rat sanitation and harborage-removal as upon the costly and never wholly successful attack upon rats in the cane fields.

Assignment of Public Health Service Officers to the Coast Guard, Army, and Navy During World War II

The largest number of officers of the Service on duty with the fighting forces in World War II was with the United States Coast Guard. The

Service has furnished medical care to the officers and men of the Coast Guard for more than 150 years. With the tremendous expansion of the Coast Guard during World War II, it was necessary to assign a large number of medical, dental, and nurse officers to that branch of the armed services.

As the need for officers with some particular training, background, or experience arose in the Army and Navy, requests were made to the Public Health Service for the assignment of such officers to perform important duties with those services.

Effective assistance was rendered to the Army by officers of the Service assigned to the Civil Affairs Branch (G-5) of Supreme Headquarters Allied Expeditionary Forces (SHAEF). A number of officers also were assigned to G-5 of various Armies and Army Groups in the African, European and China-Burma-India Theaters of Operations. Several Service officers were on duty with the Army in the Southwest Pacific and in the Philippine invasions.

A total of seven officers were assigned to the Navy during this war. These officers served in various capacities, including duty in several invasions of the Southwest Pacific and the Philippines.

MEDICAL SERVICE TO THE COAST GUARD DURING WORLD WAR II

On June 30, 1941, the personnel complement of the Coast Guard was 1,490 commissioned and warrant officers and 17,700 men, together with 18 medical and three dental officers assigned by the Public Health Service.

A military service constituting a branch of the Armed Forces of the United States at all times, the Coast Guard operates under the Treasury Department in times of peace and as a part of the Navy in time of war or when the President directs. By an Executive Order of November 1, 1941, the Coast Guard was transferred to the Navy Department, and in like manner was returned to the Treasury Department on January 1, 1946. By an Executive Order of December 23, 1941, commissioned officers of the Public Health Service serving on Coast Guard vessels and with other Coast Guard units were constituted a part of the naval forces of the United States, subject to the orders of the Secretary of the Navy.

This authorization preceded the extension of military benefits to Service officers by the Act of November 11, 1943, and the Executive Order of June 21, 1945, which declared the commissioned corps of the Public Health Service to be a military service during the period of the war. The Coast Guard, operating as a part of the Navy, played an important part in the successful prosecution of World War II.

COAST GUARD DISTRICT MEDICAL OFFICERS

Medical officers of the Public Health Service were first assigned as District Coast Guard medical officers in 1941. The officers listed below served at various times in that capacity through 1945.

I—Boston, Massachusetts
Surgeon Lee C. Watkins
Senior Surgeon (R) Charles J. McDevitt

II—St. Louis, Missouri
Senior Surgeon Leo W. Tucker
Surgeon (R) Lawrence K. Halpern

III—New York, New York
Senior Surgeon Walter G. Nelson

IV—Philadelphia, Pennsylvania
Medical Director Herbert A. Spencer

V—Norfolk, Virginia
Passed Assistant Surgeon Marion K. King
Senior Surgeon (R) Henry V. Stroupe
Surgeon (R) Sidney Taylor

VI—Charleston, South Carolina
Surgeon Kirby K. Bryant
Medical Director John H. Linson
Medical Director Joseph R. Ridlon

VII—Miami, Florida
Passed Assistant Surgeon Thomas R. Dawber
Medical Director Harry E. Trimble
Senior Surgeon (R) Charles C. Montano

VIII—New Orleans, Louisiana
Surgeon (R) Henry V. Stroupe
Senior Surgeon Frank S. Fellows

IX—Cleveland, Ohio
Medical Director Alvin R. Sweeney
Medical Director Richard B. Holt

IX—Chicago, Illinois
Senior Surgeon Harry E. Trimble
Senior Surgeon Edwin H. Carnes
Senior Surgeon Ivan W. Steele

X—San Juan, Puerto Rico
Medical Director Joseph Bolten
Medical Director Raymond A. Vonderlehr

XI—Long Beach, California
Passed Assistant Surgeon Herbert Berger
Senior Surgeon John A. Trautman
Medical Director M. Flint Haralson
Senior Surgeon James R. Shaw

XII—San Francisco, California
Medical Director Vance B. Murray

XIII—Seattle, Washington
Medical Director T. Bruce H. Anderson
Medical Director Marion S. Lombard
Surgeon (R) Reuben A. Zarilli

XIV—Honolulu, Territory of Hawaii
Surgeon Albert G. Love
Medical Director John H. Linson
Senior Surgeon George G. Holdt
Medical Director Robert H. Onstott
Surgeon (R) William H. Meyer

A shore patrol was established by the Coast Guard along all shore lines early in the war and it was through the excellent work of that organization that two groups of German saboteurs, landed by German submarines at Amaganset, Long Island, New York, and at Vero Beach near Jacksonville, Florida, were apprehended by agents of the Federal Bureau of Investigation.

In the initial stages of the war the Coast Guard was responsible for establishing, developing, and operating the United States Maritime Service and the merchant marine cadet officers' training program. The Maritime Service was separated from the Coast Guard on August 31, 1942.

During World War II, the Coast Guard officer personnel totaled 13,630. The enlisted personnel numbered 159,408. Medical care for the Coast Guard personnel was provided at marine hospitals, outpatient offices, and dispensaries of the Service. In addition, where large groups of Coast Guard personnel were assembled, special dispensaries and infirmaries were set up, the medical, dental, and nursing staff being supplied by the Service. Army and Navy hospitals were utilized for the care of Coast Guard patients where Service facilities were not available.

A total of 663 Service officers were assigned to the Coast Guard during the period from December 7, 1941 (Pearl Harbor Day) to September 2, 1945 (V-J Day), comprising 413 medical, 195 dental, six engineer, and 49 nurse officers. Practically all of the medical officers and 77 dental officers were assigned on one or more occasions to duty afloat during that period. In May 1944, Senior Sanitary Engineer Arthur P. Miller was assigned to the Coast Guard to assist in the development of a vessel sanitation program. He was aided by five other Public Health Service technical personnel—four engineers and one inspector. This detail was terminated in January 1945.

The experiences of all officers of the Service detailed with the Coast Guard during World War II for sea duty, training stations and other assignments, cannot be given in detail in this history. The incidents recorded in the pages that follow are related as types of duty performed by Service officers on sea duty and during invasions. These particular descriptions are used for the reason that they are available and because they show the wide variety of assignments performed with the Coast Guard. Officers who did not have an opportunity to participate in combat operations rendered important service in the prosecution of the war by performing well whatever duties were required of them.

SEA DUTY WITH COAST GUARD

Duty afloat with the Coast Guard included escorting supply ships from the United States to Greenland to feed and clothe the garrisons of Army personnel maintaining bases and air fields there as way stations for trans-Atlantic air transport. Coast Guardsmen manned many Naval patrol frigates to report on weather conditions in the mid-Atlantic and

also act as plane guards to spot and report trans-Atlantic aircraft. They manned a number of assault transports and cargo transports which actually carried Army and Marine Corps personnel to the invasion beaches where landing barges, carried on board, were launched and manned by Coast Guard coxswains to carry the invasion forces and their supplies to the beach, then retracting and repeating the performance. They formed the complements of some troop transports, which were usually converted liners and carried full loads of from 5,000 to 10,000 troops from one port to another. Coast Guardsmen also manned many landing craft, infantry (LCI), and landing ships, tank (LST), which proceeded in flotillas, escorted, to the invasion beaches, where they beached and unloaded, then retracted and proceeded to points of safety from air attack. Coast Guardsmen manned a number of Navy destroyer escorts which frequently formed into flotillas to escort convoys of merchant ships across the oceans or from port to port, or from port to invasion beach.

Out in the Atlantic a strange stalking game went on. The submarine and the convoy escorts stalked each other, each unseen by the other during most of the hunt. They tracked each other by sounds registered on underwater echo ranging (Sonar) equipment, like enemies groping in the dark. The merchant ships being convoyed zig-zagged to escape when an underwater warning came. The Coast Guard and other escort vessels would then swing into action making for the "contact" in order to give battle. Only when in position to attack would the submarine raise its periscope. Its prey sighted, the deadly missles were fired. In less than 30 seconds the periscope would be lowered. Only for these few seconds could the enemies see each other. Sometimes a submerged submarine would follow a ship by means of underwater listening devices for hours, or even for days.

These destroyer escorts, patrol frigates, and the larger Coast Guard cutters sank 11 enemy submarines during World War II by means of depth charges and by shelling when they came to the surface. In addition, one enemy submarine was sunk by a Coast Guard plane. This number, when compared with the 130 enemy submarines sunk by Navy surface vessels, 96 by Navy aircraft and the 63 by the Army Air Corps, shows that the Coast Guard's record conformed well with its relative man-

(Official Coast Guard Photo)

Sinking of the U. S. Coast Guard Cutter HAMILTON, *1942*

(Official Coast Guard Photo)

In mid-ocean, on board a U. S. Coast Guard convoy cutter in 1943, Dr. Thomas S. Hershey of the Service, assisted by Coast Guard pharmacist's mates, removes appendix of a Navy gun crew member transferred from a merchant convoy ship.

power and vessel strength. Coast Guard manpower and vessel strength were roughly 10 percent of that of the Navy.

Coast Guard units afloat also did important patrol work both at home and abroad, particularly in Alaska, Greenland, and in the Southwest Pacific. This involved patrolling harbors with listening devices to prevent the entrance of submarines, and in Alaska the patrolling of the vastly important inland waterways extending from British Columbia to Juneau.

COAST GUARD CUTTER ALEXANDER HAMILTON

In January 1942, after the declaration of war against the Axis countries by the United States, the Coast Guard cutter *Alexander Hamilton* was ordered to Portland, Maine, for patrol and escort duty. The *Hamilton* was lost on her first convoy trip. During this trip the *Hamilton,* as an escort vessel, made several depth charge attacks as submarines were reported to be in the vicinity. After releasing the convoy to the British at a rendezvous in the North Atlantic, she was then ordered to assist and take in tow a Navy supply vessel which was in distress. This ship was successfully taken in tow to Reykjavik, Iceland, under destroyer escort. Near Iceland, the *Hamilton* was met by a Navy tug which was to take over the tow of the disabled ship the rest of the way into port. On January 29, 1942, just following the release of the tow and outside of the channel mine fields, the *Hamilton* was jolted by an explosion on her starboard side. The time was approximately 1:00 to 1:30 P.M. on a very clear day. At the time the medical officer, Dr. James A. Finger of the Public Health Service, was in his stateroom. In reporting to sick bay he found there was some crowding because of the large number of casualties, the small space, and no electric power. With the assistance of the pharmacists' mates the first job was to administer morphine and apply temporary bandages and splints to the injured. The order to abandon ship was then received. Orders were given to place the injured men in all available lifeboats with a pharmacist's mate in each boat. Doctor Finger went in one of the lifeboats. Fortunately, they were soon picked up by Icelandic fishing boats. After a cold and wet trip they reached shore in approximately six hours. The injured were taken to local residences until they were picked up by Army ambulances and transferred to the U. S. Army Base Hospital in Iceland.

Doctor Finger in describing the incident modestly stated:

> All men and officers gave more than their best. I was glad to have the personal satisfaction of feeling responsible for saving the life of one Coast Guard officer who was not a casualty. This officer had slipped, in attempting to transfer from his lifeboat to a fishing vessel. Because of the high sides and the heavy weight of his clothing he could not reach the top of the deck for a hand hold from the water. I was glad that I had the opportunity of reaching down and holding him afloat until he could be pulled aboard.

The records of the Coast Guard state that all hands immediately took their battle stations following the explosion. Two shots were fired from one of her guns to attract attention, and flares were sent up. Listing badly to starboard, the cutter settled but remained afloat for many hours; as she was being towed into Reykjavik, Iceland, she suddenly capsized. A few gun shots from other ships sent her to the bottom. Although no one saw a submarine, the officers were sure she had been struck by a torpedo, for had it been a mine the blast would have occurred outside, not inside the ship. The shattering blast took place inside the engine room and caused live steam from broken pipes to spurt up through the midsection of the vessel. It has been officially reported that 26 men lost their lives in the disaster. Twenty were killed in action, one chief warrant officer and 19 enlisted men. Six died of wounds.

Although most of the enlisted members of the crew numbering some 200 were new men, making their first sea voyage, no confusion followed the terrific blast amidships. One of the first things the men did was to set the cutter's supply of depth bombs on "safe" so that they would not explode if the ship sank, thus imperiling men in lifeboats in the vicinity. There were no survivors among the seven members of the watch in the fireroom, engine room, and auxiliary engine room. The blast destroyed or carried away three of the *Hamilton's* seven liftboats. As this did not leave enough boats for the entire crew, the uninjured remained on ship, some of them as long as an hour, in order that the injured could be removed in the remaining boats. One hundred and one men were taken off by the destroyer *USS Gwin* which pulled alongside the crippled cutter, being one of two destroyers only a few miles away at the time. Another group was in a lifeboat only half an hour before being picked up by an Icelandic fishing trawler. Just after leaving the cutter they picked up

17 men, two of them badly injured. These men had been thrown into the sea when their lifeboat capsized. The water was intensely cold, the waves were mountainous.

USS MUSKEGET

The U. S. Coast Guard Weather Observation Station Ship *Muskeget* departed from Boston on the afternoon of August 24, 1942, en route to Weather Station No. 2, 53° N-30′ W. The first weather report from the vessel originated on August 28, 1942, while en route to her station. On August 31, 1942, she took over the station and continued with routine duties of making regular reports on weather conditions. The last report on the weather was received from her September 9, 1942, when she was awaiting arrival of her relief, the Coast Guard Cutter *Monomoy*. On September 11, 1942, the *Monomoy* reported she was unable to effect relief of the *Muskeget* due to failure to establish communications. Enemy submarines were reported active and a message was transmitted by the *Monomoy* for action by the *Muskeget* but the weather patrol vessel again failed to answer her call. Repeated efforts were made by the *Monomoy* to contact the vessel without success. On September 13, 1942, the *Monomoy* arrived at Weather Station No. 2 and cruised on station for nine days. On September 15, 1942, upon a report from the *Monomoy* of inability to communicate with the *Muskeget,* all aircraft and ships in the vicinity were directed to search for her and report any positive results. This search proved fruitless.

On October 1, 1942, having been relieved of patrol, the *Monomoy* departed from weather station en route to Boston. Arriving there on October 12, 1942, she reported that from 20 to 35 enemy submarines were daily within striking distance of Weather Station No. 2. The area between Halifax, Nova Scotia, Cape Race, Newfoundland, and Iceland, within which Weather Station No. 2 was located, was on a regular convoy route and enemy submarines were numerous. There was almost continuous action directed against these submarines by our destroyers, cutters, and aircraft.

After a year had elapsed, with no further information concerning the *Muskeget* or any of her nine officers and 111 enlisted men, the entire

personnel on board was declared officially to be dead. Dr. Haskell D. Rosenblum of the Service was the medical officer on board.

U. S. COAST GUARD CUTTER COMANCHE

The incident described below is taken from the official records of the Coast Guard. This took place on February 3, 1943, when the transport *Dorchester* sank, after being torpedoed off Greenland, 225 men being saved by the cutters *Escanaba* and *Comanche*.

Utter disregard of self in the devotion to duty is seen in the medical report of Dr. I. Ray Howard, U. S. Public Health Service, attached to the *Comanche*. Here in an improvised hospital ward on a tossing ship pursued by submarines, men are glimpsed working swiftly and efficiently in darkness to save human life, apparently oblivious of their own safety. In the light of the *Escanaba* tragedy only a short time later, the account is poignant for the detailed attention given to each precious life . . .

After the first hour, it became evident that the doctor and the Chief Pharmacist Mate could not themselves carry out the various treatments required for each patient, because of the numbers and the short intervals between the periods at which they were being brought aboard. Accordingly, members of the crew were hastily trained to help in teams of three or four . . .

The work of Doctor Howard in the care and treatment of the scores of survivors, who needed immediate attention if they were to recover, is an excellent example of the courage, devotion to duty, and coolness under fire of the medical officers, for everyone knew that several submarines were following the cutter during the rescue operations. Doctor Howard was officially commended by the Commanding Officer of the ship. The medical officers of the Coast Guard are officially members of the United States Public Health Service, but actually during their assignment they are part of the Coast Guard sharing in its hardships and triumphs, participating in its high traditions of service to mankind. These officers prefer no byline, but occasionally a glimpse is caught of their magnificent work and their heroic devotion to duty in the midst of desperate enemy action.

COAST GUARD CUTTER SPENCER

On the morning of April 17, 1943, the underwater sound operator of the Coast Guard Cutter *Spencer* established sound contact with a submarine while the ship was making a routine sweep out ahead of a North Atlantic Convoy. Before a pattern of depth charges could be dropped, the submarine headed directly under the convoy, thereby obtaining temporary refuge. The game of hide-and-seek lasted for ap-

proximately one hour. The submarine ran back and forth underneath the convoy while the *Spencer* attempted to follow it with the underwater sound gear, weaving in and out of the long line of ships in the convoy. Eventually, the convoy passed on, and the submarine was left behind far enough in the clear that the *Spencer* could safely drop depth charges without blowing up ships of the convoy. After two patterns of charges had been dropped, the submarine, apparently damaged, could be seen breaking surface just off the port bow of the *Spencer.*

Because only its port engine was operating, the submarine slowly swung to starboard and gradually headed toward the starboard bow of the *Spencer.* The *Spencer* began firing all her guns, and many hits on the submarine were observed. The Coast Guard Cutter *Duane,* in the immediate vicinity, assisted, firing all her batteries. The submarine was boarded momentarily just prior to its sinking, and three men were observed to be dead in the conning tower. The surviving crew abandoned ship and were rescued by the *Spencer* and the *Duane.* Dr. Herbert Tabor was the medical officer on the *Duane.*

A few moments after the cease firing order was given by the *Spencer's* captain, a sailor was seen to come out of the escape hatches on the deck of the submarine. He hurriedly swung the deck gun around toward the *Spencer* and fired one high explosive shell. Instead of striking the ship broadside, this shell hit a davit up forward, exploded, and fragments of it and the davit were sprayed over the entire starboard side. After the cease firing order and before the submarine fired its shot, there was considerable shouting on deck and Dr. John J. Davies, the medical officer attached to the *Spencer,* opened the starboard hatch of the sick bay to look out on deck. At that instant, the submarine fired her shell and he received a superficial shrapnel wound in the right forearm.

In the *Spencer's* crew, 27 casualties resulted with one death. During the next 72 hours, the 26 surviving casualties and two prisoners from the submarine were given medical care by Doctor Davies despite the fact that he had been wounded. Of the 26 surviving casualties, seven were seriously injured.

On the evening of the fourth day, the *Spencer* arrived in Gurock, Scotland, to discharge the prisoners taken from the German submarine U-175 and the more serious casualties of the crew.

U. S. COAST GUARD CUTTER ESCANABA

On the 13th of June 1943, at 5:10 A.M., the Coast Guard Cutter *Escanaba* blew up and sank within three minutes in the North Atlantic. The entire crew of 103 were lost, with the exception of two men. Observers aboard the Coast Guard Cutter *Storis,* the vessel nearest the *Escanaba* at the time, saw a cloud of smoke and flame billow upward into the air and the cutter sank almost immediately, leaving only small bits of wreckage afloat. The ship sank so quickly that no signals were sent from it. The Coast Guard Cutter *Raritan* picked up the two survivors who said they had no idea what caused the explosion. The most probable explanations are that the disaster was caused by a mine, torpedo, or an internal explosion of magazine or depth charges, but the evidence is not sufficiently conclusive to assign the cause directly or even remotely to any of these.

At the time of the sinking, the *Escanaba* was part of Task Unit 24.8.2 which was escorting convoy GS-24 from Narsarssuak, Greenland, to St. John's, Newfoundland. The convoy had departed from Greenland on June 10 and was made up of the Coast Guard Cutters *Mojave* (Flag), *Tampa,* and the *Escanaba,* escorting the *USAT Fairfax* and the *USS Raritan.* On June 12 the Coast Guard Cutters *Storis* and *Algonquin* joined as escorts.

Dr. Ralph R. Nix of the Public Health Service was lost with the other members of the crew of the *Escanaba.*

A FLOTILLA OF LCI'S

In February 1943, Dr. Leon Holloman and Dr. Romeo J. Gentile, medical officers of the Public Health Service, sailed from Galveston, Texas, as the medical staff of a flotilla of 24 Landing Craft, Infantry. After a shake-down cruise, the flotilla proceeded to cross the Atlantic by way of Bermuda.

When illness occurred in any member of the crew of the 24 different vessels during the trip, it was necessary for either Doctor Holloman or Doctor Gentile to transfer from one ship to another while under way in mid-ocean. After a long voyage (23 days) they at last arrived at Port Lyautey, French Morocco, North Africa. There, some time was spent

in training for amphibious landings. The flotilla then sailed unescorted through the Straits of Gibraltar and stopped at several North African ports along the Mediterranean for further training. At Bizerte they merged with a large naval force and proceeded to Malta, thence to Sicily for the first mass amphibious landing. The sea was extremely rough the day before the landing and more than half of the entire personnel were seasick, including the two medical officers of this flotilla. At midnight, preceding the invasion, the weather and sea became calm as the fleet stood about five miles off Sicily. Doctor Holloman recalls that "everyone was grim, quiet, and somewhat frightened as the enemy searchlights spotted us and brightened the night into day."

The LCI's proceeded to the beach under heavy fire from shore and air. A bomb ripped off the stern anchor cable of the vessel to which Doctor Hollomon was attached. The ship was washed broadside to the beach. Another bomb destroyed the forward part of the ship, including the surgical unit. The ship was abandoned and the entire complement went to the beach under heavy fire from the shore batteries as United States warships pounded the enemy and finally silenced their fire. A number of casualties occurred on shore among the personnel during this landing. Doctor Holloman soon joined a Naval Beach Party Surgical Unit and worked all D-day attending the wounded.

The next day Doctor Holloman secured a small craft equipped with litters and with several pharmacist's mates went from one ship to another of the flotilla administering first aid and evacuating casualties to the beach. The enemy air force made spot raids for several days and nights. On the third night a load of casualties was assembled on the deck of an LCI, and they were returned to Bizerte. During the voyage Doctor Holloman administered the necessary surgical care to the many wounded.

A few weeks later a similar landing was made at Salerno, Italy. The task of the flotilla to which Doctors Holloman and Gentile were attached was to transport troops from the large ships to the beach after the initial landing. The casualties were heavy. Both Doctors Holloman and Gentile worked long hours giving early treatment to the unending stream of wounded men. After the Salerno campaign, Doctors Holloman and Gentile served in a naval hospital at Bizerte for several weeks. Later,

the flotilla proceeded to England to prepare for the Normandy invasion. In England, Doctor Holloman served at a naval dispensary and hospital at Falmouth and later at Dartmouth. During February of 1944, while serving at the naval hospital in England, Doctor Holloman was dispatched to a ship in the English Channel which had an injured officer aboard. The weather was cold and stormy and almost everyone was seasick. The vessel to which they were going was far out in the Channel. Doctor Holloman and a pharmacist's mate were transferred to the wounded man's ship to release his crushed arm from a tow line and to transfer him to the rescue ship on a litter. As Doctor Holloman was being transferred back to his ship after giving the necessary treatment in releasing the injured officer's arm, a large wave parted the ships and Doctor Holloman was plunged between them into the icy channel. Fortunately, he was rescued promptly although he states, "I was scared and nearly frozen stiff."

Doctor Holloman, having served with the Coast Guard since November 1940, was relieved from duty with the flotilla and returned to the United States in April 1944.

SICILY

The excerpt quoted below is from a verbatim report of an interview (routine procedure with the Coast Guard for wounded personnel) with Lieutenant (j.g.) Frank Cankar of the Coast Guard a day or so after being wounded by enemy action in 1944 during the invasion of Sicily:

> . . . I was transferred to a second ship on which we had a little operating room and Lieutenant Commander Gentile of the U. S. Public Health Service—who, incidentally, is an awfully good surgeon. When I got over on this other ship, why to give you an idea of how little you feel when you get hit (I mean there isn't any pain at the time or the pain is so great that you don't feel it anyway; I don't know which), he told me that he'd have to sew me up a bit and he put a stitch or two in my left side without my even knowing that he had done the job. Then just about that time the engines on that ship broke down and I was transferred to a third ship and 24 hours later I landed in Bizerte . . .

USS BAYFIELD—APA-33

The peregrinations of the *USS Bayfield,* a Coast Guard manned assault transport, for a period of about two years beginning in November

(Official Coast Guard Photo)

U.S.S. Bayfield

(Official Coast Guard Photo)

U.S.S. Cavalier

(Official Coast Guard Photo)

Dr. James W. Todd, Public Health Service, transferring in mid-ocean from a Coast Guard-manned destroyer escort to attend a seaman aboard a merchant convoy ship, 1943.

1943, as seen through the eyes of a young medical officer on board, Dr. James H. McDonough, are given below.

After a training period in the Chesapeake Bay, the *Bayfield* went to England in February 1944, disembarking United States troops in Scotland. After a period of amphibious training on the southern coast of England, the *Bayfield* underwent alterations converting it into a communications ship. Rear Admiral Don P. Moon, U. S. Navy, took the *Bayfield* as his flagship prior to the Normandy invasion. This vessel was the flagship for the Utah beachhead during the invasion. She arrived off the coast of Normandy on D-day morning and remained there for approximately three weeks. In addition to operating as a communications ship, she handled hundreds of casualties from the hard-pressed beach. These casualties were subsequently transferred to LST's (landing ships, tanks) and sent to England. Following the invasion of the Channel coast of France, the *Bayfield* returned to England and thence to Italy during the planning stages of the invasion of southern France.

On D-day of the invasion of southern France, the *Bayfield* was off Saint Rafael, the easternmost area of that operation, remaining there for one month and functioning as a communications and headquarters ship, and assisting in the evacuation of casualties.

After returning to the United States for a month of repairs and overhauling in November 1944, the *Bayfield* departed for the Pacific area, remaining for two months of training and maneuvers in the Hawaiian Islands, thence to Saipan and Iwo Jima. Doctor McDonough became medical officer of the beach battalion of the *Bayfield* preparatory to invasion activities in the South Pacific.

Soon after this Doctor McDonough was transferred to the *USS Ozark*. That vessel had been converted into an auxiliary hospital ship staffed by some 15 medical officers and more than 100 pharmacist's mates. The *Ozark* was part of the flotilla which arrived off Iwo Jima on D-day morning. On the evening of D-day the beach battalion of the *Bayfield* was ordered ashore due to the heavy casualties on the beach. Doctor McDonough spent two days there. He then returned on board the *Ozark* which stayed in the area for about 10 days. The *Ozark* remained close to the shore at nights, while the other transports retired. They received and treated hundreds of casualties, later transferring them to

hospital ships or returning them to active duty. There were numerous cases of acute exhaustion which responded well to a few days' rest on board. Following this operation Doctor McDonough rejoined the *Bayfield* at Saipan.

The *Bayfield* embarked elements of the Second Marine Division and arrived off the southeastern coast of Okinawa on D-day morning. It was the function of the squadron to which the *Bayfield* was attached to simulate a landing in this area on D-day and D-day plus one. The *Bayfield* then retired to sea and awaited orders. The operation progressed favorably ashore and it was not necessary to land the marines on board. After several weeks of awaiting possible recall to Okinawa and spending some time in the Guadalcanal area, the *Bayfield* picked up supplies and personnel from various islands and returned to Guam. From thence Doctor McDonough was returned to the United States and assigned to duty at the Coast Guard training station, Fort McHenry, Baltimore, Maryland.

NORMANDY INVASION

The *Bayfield* served as a hospital ship during the invasion of France. Dr. Ralph R. Braund of the Service, a well-qualified surgeon, was the Chief Medical Officer on board. Portions of a letter written by Doctor Braund to another medical officer of the Public Health Service in Washington, D. C., soon after the invasion gives an interesting account of what occurred on that ship. On one day the wounded brought aboard totaled 312. Doctor Braund and his staff of three medical officers and one dental officer of the Public Health Service, and one medical officer of the Navy, worked 60 hours at one stretch.

USS Bayfield
Fleet Post Office, N. Y.
July 8, 1944

. . . We had known for three or four days that the big show was due to go on. Unfortunately the weather delayed us a day so we were cooped up for an additional twenty-four hours. Having nothing for the boys to do I manufactured work—that is, I had them check and recheck all dressing stations, first aid equipment, and supplies. Everyone was glad when orders came to sail. Needless to say, we had little sleep that night. When we awakened the next morning it was an inspiring as well as comforting sight to see so many ships. Before we could see the beach the battle-

wagons, cruisers, and destroyers had started their incessant pounding of the beach. This continued through the day and night. It was like two old-fashioned Fourth of July celebrations wrapped up in one. Though I had been through a few air raids we did not look forward to that first night with any pleasure. Jerry did not disappoint us. In the twenty days we remained off the beach, he was over seventeen nights. The last three were quiet. However, we were lucky. We had one alongside that was close enough to start pipes leaking and crack several porcelain lavatories. The boys in the sick bay thought the next one would be "it." I bet my chief ten dollars to one we wouldn't get hit. That sort of broke the tension. I had a good bet because if we had I might not have been available for him to collect. But all in all it wasn't bad as far as we personally were concerned. Other ships unfortunately did not fare so well.

The evening of the first day (June 6) we began to get our first casualties and a rather grim lot they were. Most of them had been wounded between 7 and 8 a.m. . . . My boys did a marvelous job. I felt amply repaid for the hours of instructions and drills we had. Though none of my corpsmen had any experience they could have not been better. Many a chap is alive today because of their efforts. And here let me give credit to those thousands upon thousands of people who have given their pint of blood that some soldier might live. It was remarkable to see those boys come back after 500 to 2,000 cc. of plasma had been given to them. Many were in such extreme shock that you had to cut down to find a vein. I got rather good at hitting femoral veins during those three weeks. Often the casualty load became so heavy my force could not handle it, and then everyone in the ship's crew that could be spared from his other duties, turned to. In only a few instances was it necessary to give blood; though if time had permitted we probably would have given more. The crew was our source of donors and a very willing source they were. One day I called over the loud speaker for two donors and in less than five minutes I had 88 boys come to my office. Makes you proud you're an American to see such spirit.

. . . We stayed off the coast from the 6th to the 26th acting as hospital ship for those casualties brought from the beach and from ships sunk in the area. The number we had aboard at one time varied as we sent them back to England when they could be moved. Our high was 312 on one day. For sixty hours in one stretch the boys were on duty. I drank so much coffee that I was having extra systoles every 4th or 5th beat.

However, as the Army got their facilities set up ashore our load became lighter and I was able to get on French soil two different afternoons. All you need to do is to know where you want to go and crawl on any vehicle going your way. I rode everything except planes. I also regretted that I didn't take my French teacher a little more seriously 20 years ago.

I feel my boys did a stupendous job . . . We lost only 1% of those brought aboard alive, which if I could give you the total number you'd agree was quite good . . .

Participating in the Normandy invasion was Coast Guard Rescue Flotilla One. This flotilla made 1,438 rescues from the English Channel during the invasion of France. The heaviest part of their work was on D-day but three months later these tiny craft were still picking survivors out of cold stormy waters—sometimes as many as 100 a day.

Two medical officers of the Public Health Service, Dr. Martin R. Boltizar and Dr. John S. Micelli, were assigned to this flotilla.

USS CAVALIER

The *USS Cavalier* was an 18,000 ton assault transport (APA-37) which was designed to carry troops into beach landings and to evacuate wounded from the beaches. Her normal complement was about 400 men. She had bunk accommodations for about 1,500 troops. The sick bay area was arranged so that she could accommodate approximately 250 wounded. These facilities could be expanded with ambulant casualties to approximately 500.

In addition, this ship carried 26 landing boats, four of which landed tanks; the remaining carried personnel and such small vehicles as jeeps and motorcycles. She carried the repair facilities for maintenance of the boats and the diesel engines in the boats. She could also carry a considerable amount of combat cargo.

The medical personnel aboard included five medical officers, one dental officer, and 30 hospital corpsmen. One medical officer and eight of the hospital corpsmen were assigned to the beach party and these went in with the initial landing boats to establish evacuation stations for casualties to the boats thence to the ships. A Service officer was the beach party medical officer in every action engaged in by the *Cavalier.*

The *Cavalier* was manned by Coast Guard personnel. She was a transport division flagship and group flagship. Of the medical officers, there were four Public Health Service officers and one Naval officer. The hospital corpsmen were Coast Guardsmen.

Dr. Paul E. Walker was assigned to the *Cavalier* on November 1, 1943. About the first of June, 1944, she embarked elements of the 27th Infantry Division and on June 5, 1944, crossed the 180th meridian at 15°, 10° north, bound west. After a rendezvous in the Marshall Islands with other ships of the invasion force, she participated from June 16

to June 26, 1944, in the initial invasion of the Island of Saipan in the Marianas and subsequent occupation. On July 24, 1944, she embarked units of the 2nd Marine Division and participated in the initial invasion of the island of Tinian in the Marianas. In one day of action, she evacuated over 600 wounded and sick, and re-transferred most of them by boats to the island of Saipan. The *Cavalier* engaged in this action from July 24 to July 28.

Following this action, the more seriously wounded were carried back to Honolulu through the Marshalls and after a period of rehabilitation and further training, units of the 7th Division were embarked at Honolulu. At the time it was thought that the *Cavalier* was to participate in the occupation of Yap, but by the time Manus Island in the Admiralties was reached, it was found that the *Cavalier* was to participate in the invasion of the Philippines. October 20 to October 23, 1944, she participated in the initial invasion and liberation of the island of Leyte in the Philippine Islands. She evacuated wounded from this engagement to the island of Manus. Very shortly thereafter, she was ordered to New Guinea and there embarked elements of the 11th Airborne Division and speedily transported them back to Leyte for reinforcement when the battle was apparently going against the United States forces. Only a few casualties were embarked on this occasion and the *Cavalier* was again ordered back to Manus and from Manus to New Guinea where she spent Christmas Day of 1944.

From New Guinea troops of the 77th Division were embarked and on January 10, 1945, participated in the initial landings on Luzon Island at Lingayen Gulf in the Philippines. The wounded were evacuated from this engagement to the base then established in Leyte Gulf. On January 30, 1945, troops of a regimental combat team were embarked and landed without opposition at San Antonio in the Philippine Islands, the purpose of this combat team being to cut off the Japanese before they could retreat to Corregidor.

At 12:30 A.M. on January 31, 1945, the *USS Cavalier* was struck in the stern by a torpedo and suffered 60 casualties, none of which was fatal. The ship was then taken under tow and proceeded some 500 miles through submarine-infested waters at about five knots an hour to Leyte Gulf, going through the China Sea, the Sea of Mindanao, and

into Leyte Gulf. Later she was towed back to Pearl Harbor, a distance of about 5,700 miles, arriving there in May 1945. During this time, on occasions, there was only one destroyer escort.

Doctor Walker, as Chief Medical Officer, was in charge of all the medical activities on the ship and was responsible for the proper evacuation and care of the casualties embarked. Being a surgeon, he also performed most of the major operations. Complete records of the total number of casualties handled during the time that he was aboard were not kept, but it was approximately 2,000. In addition to his duties as Chief Medical Officer, he was also Division Medical Officer and at times Transport Group Medical Officer. Doctor Walker was relieved from the *Cavalier* in March 1945. He was succeeded by Dr. O. Carey Williams.

During November 1943 Dr. William P. Kroschel was assigned as the dental officer aboard the *USS Cavalier*. He joined the vessel about the time that it was placed in commission.

Doctor Kroschel participated in all the invasions and other combat activities of the *USS Cavalier* during the time he was on this duty. During the invasion actions the dental officer worked as a member of the medical team aboard the ship. Usually the dental officer acted as casualty clearing officer. His immediate duties were concerned with casualty traffic; that is, immediate emergency treatment and disposition of the wounded. With pharmacists' mates and other personnel of the medical team, the dental officer received the casualties, sorted them, controlled hemorrhage, instituted transfusions, applied temporary splints, and prepared the wounded for final examination and treatment by the operating surgeons.

Not only did Doctor Kroschel handle the dental work of his ship, but he also provided dental care to personnel of smaller craft, such as destroyers, destroyer escorts, mine sweepers, and merchant marine ships, as well as to Army and Marine Corps personnel when aboard.

Doctor Kroschel was relieved from duty with the Coast Guard and returned to the United States about June 1, 1945.

USS CALLAWAY

The *USS Callaway* was the first vessel of its type to be outfitted for use as an attack transport. It was designated APA 35. The ship was

commissioned in New York. The outfitting of the sick bay and hospital was supervised by officers of the Public Health Service, who were detailed aboard the ship before commissioning.

At the time of commissioning Dr. William Hyatt Gordon was the senior medical officer, and Drs. Ralph S. Lloyd, Paul A. Kaufman, and William Lewis completed the medical staff. All hospital corpsmen were Coast Guard enlisted personnel who had been trained at the Manhattan Beach Coast Guard Station by the Coast Guard and Public Health Service personnel.

The *Callaway* proceeded to San Diego where she joined other vessels of the 5th Amphibious Force in training operations. On January 3, 1944, the ship sailed for the invasion of Kwajalein in the Marshall Islands with the initial attack force of the 4th Marine Division on board.

During the Marshall Islands engagement approximately 100 casualties were received on board by the Medical Department. After the invasion the ship was ordered to the southern hemisphere. Prior to sailing, Dr. T. Burton Smith of the Service, and Dr. Chester E. Lee, a medical officer of the Navy, were added to the medical staff.

She proceeded to Funafuti and thence to New Caledonia awaiting orders. The *Callaway* was proud to be chosen for a hit-run assault on a small island north of Kavieng. For this the *Callaway* received on board the raider elements of the first Marine Division of Guadalcanal. With other surface and air support she surprised the Japanese and landed her troops, who captured the island without mishap. This was the occupation of Emiru Islands which made it possible to neutralize Kavieng, Rabaul, and Truk, of the central Pacific, by means of land based aircraft.

All on board were delighted when it was found that the *Callaway* was returning to Hawaii. After much secrecy and many training operations the *Callaway* found itself in a huge assault group which finally turned out to be the attack on the Marianas. They were assigned to the initial attack group for the central beach of Saipan. During the first day of the engagement approximately 287 casualties were received on board from the assault force. During this engagement Dr. T. Burton Smith was the beach party medical officer. His expeditious handling of casualties at the beach reflected credit on his professional ability. There were very

few fatalities aboard ship; an important factor in this was the fine work of the medical department.

Included in the casualties received on board during this engagement was a native woman with a newborn infant. This posed a problem of devising a means of feeding the infant, since the mother could not do so. A small Japanese boy was also taken on board at that time, and he promptly became the favorite of the ambulatory patients.

Dr. Ralph S. Lloyd was the dental officer aboard the ship. It was particularly interesting work for a dentist. Between invasions teeth were filled, gums were treated, teeth were extracted, and even dentures were constructed while at sea. It was a novel experience for a dentist to be preparing a cavity in a tooth with the ship rolling 15°. It was a somewhat unpleasant experience for the patient as well. During the invasions the dental officer worked closely with the medical team and performed numerous duties of a medical officer, processing new casualties, giving plasma, and administering anesthetics. The medical officers were usually kept extremely busy with the surgical cases.

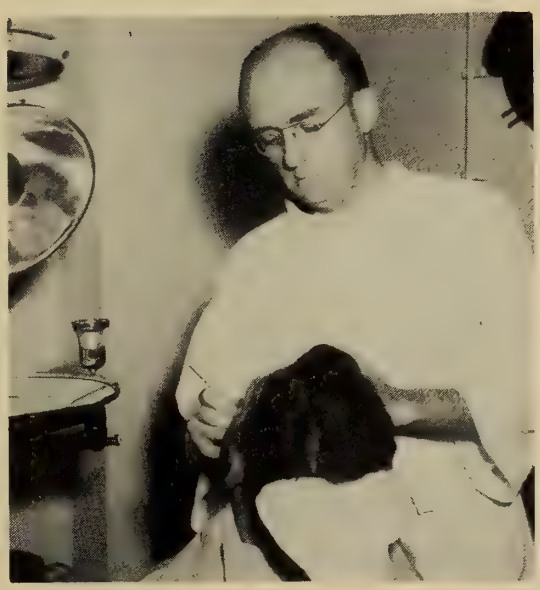
Upon return to Hawaii from Saipan Doctor Gordon was detached. He was relieved by Dr. John J. Danahey. Doctor Lloyd was relieved by another dental officer, Dr. Jackson Bates.

The *Callaway* staged elements of the 81st Division (Wild Cat Division) for the assault on the Palau group. The vessel then staged troops at Hollandia, New Guinea, and staged 6th Army troops for initial engagement of the Philippines on Leyte Island. Prior to this operation Dr. Benjamin Wolfman joined the vessel. Following the initial invasion of the Philippines the *Callaway* transported reinforcements to those islands, and then in December 1944 staged other elements of the 6th Army at New Guinea and participated in the Lingayen Gulf operations making landings. While in the South China Sea the *Callaway* was struck by a Japanese kamikaze plane on January 9, 1945, and suffered 53 casualties including 29 killed. A number of the wounded died later as the result of their wounds.

The vessel then proceeded to Guam by way of Ulithi where voyage repairs were made, and at Guam there were elements of the 1st Division for the Iwo Jima operation. Doctor Smith was beach party medical officer in all those operations. During the operations at Iwo Jima ap-

(Official Coast Guard Photo)

Dr. William W. Calhoun, Jr. (right), dental officer of the Service, assisted by a pharmacist's mate, treating a wounded soldier in the sick bay of a Coast Guard-manned assault transport in the invasion of Saipan. During assaults, dental officers work with the medical team, 1944.



(Official Coast Guard Photo)

Dr. Ralph S. Lloyd, dental officer of the Public Health Service, treating a Coast Guardsman aboard an assault transport in the South Pacific, 1944.

proximately 300 casualties were received on the ship. Doctor Danahey was detached at Guam prior to the Iwo Jima operations, and Dr. Paul A. Kaufman became the senior medical officer.

Upon return to Guam where all casualties were disembarked, Dr. John J. Burke joined the vessel as senior medical officer. The vessel then proceeded to Noumea, New Caledonia, to carry troops of the Okinawa invasion.

While getting casualties on board at Iwo Jima one Marine from the 4th Division, when hoisted on board, asked what ship this was. When told it was the *Callaway,* he said, "Everything will be all right now, I am home." He had been received on board as a casualty at Kwajalein and at Saipan.

At Noumea the vessel again met with old friends of the Wild Cat Division. As the Okinawa campaign did not require further reinforcements, the 81st Division was transported to the Philippines to participate in the Mindanao operation. This was the last engagement participated in by the *Callaway* during the war. The *Callaway* was awarded a Presidential Citation.

USS CAMBRIA

On October 1, 1943, Dr. Robert L. Griffith was assigned to the pre-commissioning detail of the attack transport *USS Cambria* (APA 36). After a period of procuring supplies and training personnel, Doctor Griffith took part in the following invasions:

1. Marshall Islands; January and February 1944.
   Majuro; unopposed.
   Kwajalein; support operations.
   Eniwetok; initial landings and entire campaign.

2. Mariana Islands; June, July, and August 1944.
   Saipan and Tinian; initial landings and entire campaign.

3. Philippine Islands; October, November, and December 1944, January and February 1945.
   Leyte; initial landings and one return trip with reinforcements.
   Luzon; initial landings and one return trip with reinforcements.

4. Okinawa; April 1945; initial landings and first 10 days of the sea battle.

After the major part of the fighting was over on Saipan, the personnel of the Medical Department of the *USS Cambria* aided the Army in treating civilian casualties ashore.

In September 1944 Doctor Griffith was assigned additional temporary duty as medical officer for Transport Squadron 12 and served in that capacity for the rest of his assignment.

USS SERPENS

The *USS Serpens* (AK-97), a cargo ship manned by Coast Guard personnel, sank after an explosion on January 29, 1945, while anchored off Lunga Beach, Guadalcanal. The explosion was possibly due to an enemy attack. A 14,250 ton ammunition ship, the *Serpens,* was loading depth bombs at the time. A number of other ships nearby were damaged in the explosion, which also caused some damage ashore. Eight officers and 188 crewmen, including a medical officer of the Public Health Service, Dr. Harry M. Levin, all that were on board at the time, were killed. The only survivors were two officers and eight men who were ashore at the time of the explosion. In addition, 57 Army personnel, including one officer, were killed.

An eyewitness account of the episode follows:

> As we headed our personnel boat shoreward the sound and concussion of the explosion suddenly reached us, and as we turned, we witnessed the awe-inspiring death drama unfold before us. As the reports of screeching shells filled the air and the flash of tracers continued, the water throughout the harbor splashed as the shells hit. We headed our boat in the direction of the smoke and as we came into closer view of what had once been a ship, the water was filled only with floating debris, dead fish, torn life jackets, lumber and other unidentifiable objects. The smell of death, and fire, and gasoline, and oil was evident and nauseating. This was sudden death, and horror, unwanted and unasked for, but complete.

A monument was dedicated in 1949 in the National Cemetery at Arlington, Virginia, in memory of those who lost their lives in this military action.

LST DUTY

After a period of amphibious training late in 1944, a Coast Guard group of 12 Landing Ships, Tanks, to which Dr. Vernon G. Guenther

and Dr. Albert A. Bremer were attached, was sent to Panama City, Florida, thence to New Orleans, and from there to Hawaii.

In Hawaii, there were rehearsals of amphibious landings on various islands. This group of LST's then embarked elements of a Marine artillery unit, amphibious trucks, artillery pieces, and ammunition which were put ashore in 1945 at Iwo Jima on D-day of the invasion. These LST's remained anchored close off Iwo Jima so that the amphibious truck drivers could return to the ship for ammunition as necessary. During the invasion a number of wounded were taken aboard the LST to which Doctor Guenther was assigned, where they were given emergency care before being transferred to the evacuation ships.

The next invasion operation in which this unit participated was Okinawa. The LST's transported a unit of United States troops and landed them in the customary manner on the first day of the invasion. During this operation these LST's were attacked several times by Japanese planes.

During the remainder of Doctor Guenther's assignment these Coast Guard vessels transported men and materials from one theatre of war to another. The freight operations of that group of LST's took them as far south as New Caledonia and as far north as Amori at the northern tip of the island of Honshu in Japan.

Doctor Guenther was relieved from duty with the Coast Guard in December 1945.

ALL IN THE DAY'S WORK

The following report from the official records of the Coast Guard is worthy of notation. This episode took place on May 15, 1945.

> Later the same day the *Forsyth's* doctor, Ralph B. Samson, was called upon to perform a major operation in mid-ocean on an American sailor who had been critically wounded aboard the German U-boat in the accidental discharge of a pistol.
>
> And as a final ingredient to these events, Doctor Samson was assisted in the operation by the German U-boat doctor, who volunteered to try to help save the life of the American sailor . . .

COAST GUARD AVIATION

As the aviation activities of the Coast Guard expanded during and after World War II and with the increasing emphasis on the use of

aircraft in sea-rescue operations, it became necessary for the Public Health Service to secure training for certain selected medical officers as flight surgeons prior to or during their assignment for aviation duty with the Coast Guard.

Medical officers receiving training as flight surgeons were assigned to duty at the U. S. Naval School of Aviation Medicine at Pensacola, Florida, where regular courses were conducted for training Naval medical officers.

Officers receiving this training fell into two categories: Those who completed the course and also received "flight indoctrination" were designated naval flight surgeons and received their wings; those who completed the course but did not receive flight training were designated aviation medical examiners. Practically all of the Public Health Service officers who took this training received their wings. Among the officers who received this training were:

Dr. James L. Baker
Dr. William S. Baum
Dr. William G. Budington
Dr. Edwin H. Carnes
Dr. James B. Donaldson
Dr. Selwyn A. Drummond
Dr. John C. Grier
Dr. William A. Himmelsbach
Dr. John W. Murray
Dr. Henry C. Savage
Dr. Alan F. Thometz

TRAINING STATIONS

Public Health Service officers were assigned to the several training stations of the Coast Guard. The medical activities at the Coast Guard Training Station, Manhattan Beach, Brooklyn, New York, and at the U. S. Maritime Training Station, Sheepshead Bay, Brooklyn, New York, were unique in several ways. These two training stations were the largest of their respective services and were situated adjacent to each other. The U. S. Public Health Service Hospital at Sheepshead Bay lay between these training stations and served as their base hospital for complements of about 10,000 Coast Guard trainees and approximately 12,000 Maritime Service trainees. The medical activities were unified under a single command for the hospital and the two training stations. Medical and dental officers were utilized interchangeably among the three units. This system promoted a high level of professional endeavors

and permitted rotation of officers on hospital duty along with the usual barracks and sick bay assignments. During the period 1942 to 1945 a total of about 43,000 Coast Guardsmen and almost 90,000 Maritime Service enrollees were trained at the two stations. This activity was the largest single unit of Public Health Service operation in World War II.

Service Officers Assigned to the U. S. Army China-Burma-India Theatre of War

From September 1941 until the end of 1943 Dr. Victor H. Haas was in charge of a group of Public Health Service officers on duty with the Army in that part of the world which became known as the China-Burma-India Theatre of War. This group assisted in the construction of a railway from China to Burma, participated in the general retreat from Burma, and served in Army installations scattered from Chungking to Eritrea.

Initially designated as the American Medical Commission to the Yunnan-Burma Railway, the group consisted of the 15 officers listed below. Six were already in the Public Health Service. Nine were recruited for the mission, four of whom subsequently accepted permanent assignments in the Service.

Senior Surgeon Victor H. Haas
Senior Surgeon Paul H. Stevenson
Senior Surgeon Fred P. Manget
Senior Sanitary Engineer Daniel E. Wright
Senior Sanitary Engineer Henry A. Johnson
Senior Sanitary Engineer Arthur B. Morrill
Surgeon Thomas H. Tomlinson
Pharmacist Carl Gohman
Sanitarian William L. Jellison
Sanitary Engineer Lawrence B. Hall
Sanitary Engineer Fred Thomas
Sanitarian Frank W. Fisk
Sanitarian Gordon E. Smith
Assistant Sanitary Engineer Edward Lacey
Assistant Administrative Officer Joseph Pasterski

Dr. Marshall C. Balfour of the Rockefeller Foundation served as a consultant. At one period more than 100 Chinese personnel—professional, technical, and clerical—were working on this project.

The purpose of the mission was to provide preventive medicine and public health services for over 150,000 workers engaged in building a railway which was to run from Kunming, China, to Lashio, in Burma. This railway was to carry supplies into China through the "back door," as Burma became known after the Chinese ports were lost. The Burma Road, an automobile highway, was already doing this, but inadequately. The group's responsibilities also included advising and assisting the Chinese medical staff of the Railway in providing adequate curative medicine. The story of the initial mission falls into three phases: (1) Getting men and materiel to the site of operation; (2) doing the job in the field; and (3) withdrawal from the operation, a step dictated by circumstances imposed by the war.

GETTING TO THE JOB

The initial phase, getting men and equipment to the job, was never completed. Personnel left the United States in groups, by air from San Francisco, but the outbreak of war delayed the arrival of five men in Burma from December until April, so that there was less than two-thirds of the staff on the job up until the very end of the original assignment.

Supplies, provided in the United States by lend-lease, were shipped to Rangoon, but only the first lots arrived, the great bulk being diverted en route, going to Karachi, whence nothing could be sent to the group in Burma. Almost a year later, this materiel was taken over by the U. S. Army, much of it being used by the group in Army assignments.

As fast as personnel and supplies arrived at Rangoon, they were deployed to the site of the operation. By the end of December 1941, three medical, four sanitary engineer, and two sanitarian officers, one pharmacist, and one administrative officer were at work on the railway. They established general headquarters at Lashio, the railhead in Burma, and a field headquarters at each of the three divisions comprising the 300 miles of railway construction.

OPERATIONS IN CHINA AND BURMA

Dr. Paul H. Stevenson was the first of this group to traverse the entire right-of-way from one end to another, traveling by foot, horseback, and carrying-chair. No white man had been over this line before that,

and it is believed that Doctor Stevenson was the first white man to enter some of those remote villages. The next to make the complete trip was Dr. Fred Manget, then about 62 years old, a rugged, indomitable man who had been a medical missionary in China for many years. Between these two trips, the road was traversed by another member of the group, the Chinese nurse consultant, Miss Gertrude Pao.

Meanwhile, the American and Chinese members of the mission were getting the work under way. Surveys were made, some very quickly, in order to determine the extent of medical, sanitation, and organizational problems. Plans were developed and, even as early as November 1941, actual public health and medical operations were in progress. These included hospital construction, camp sanitation, malaria control, and immunizations. Before Christmas a system of disease reporting had been established, and something had been accomplished toward improving the deplorable diet and shelter of railway construction workers. General medical, nursing, and sanitary conditions were noticeably improved through the efforts of American and Chinese personnel even before January, but there was so much to be done and the difficulties were so great that no one felt that the goals would ever be attained.

All of China was supplied at that time through the single port of Rangoon, except for minor supplies smuggled through Japanese lines. Docks were piled with tons upon tons of materiel. Goods consigned to the Railway to which this group was assigned had to be cleared through Burma customs before leaving the docks. This was supposed to be done by the Rangoon office of the Yunnan-Burma Railway Administration. It involved the worst kind of Oriental haggling in which Chinese, British, and Burmese were concerned. Once through customs, supplies had to be shipped some 500 miles from Rangoon to Lashio, either by the Burma Railways or by highway. Both were inadequate, and everyone who had supplies in Rangoon had to compete in a continuous struggle for transport priorities. To make it worse, all lend-lease goods consigned to China were supposed to pass through Burma in a transit status. The Yunnan-Burma Railway, as well as the Service group, maintained headquarters in Lashio, Burma, and had to use a great deal of equipment there, especially vehicles. The Burma government constantly made trouble about this, and no doubt they had a legalistic basis for doing so,

since the real fault lay in improper phrasing of the lend-lease agreements between Washington and London.

At Lashio, the Yunnan-Burma Railway maintained vast storage and trucking facilities. Supplies coming from Rangoon were trans-shipped to the line of railway construction, over circuitous routes, often involving the use of animal caravan, to reach their ultimate destination.

The Chinese had their own customs at the Burma border, and this was even more exasperating than the Burma customs. Vital supplies were often held up for days by the intricacies of Chinese clearance procedures, and trucks lining the Burma road in this area presented a fantastic sight which invariably infuriated Americans who realized that the United States had contributed the materiel which was being delayed. There was probably some justification for the action of the Chinese customs, however, since the truck drivers on the Burma Road were incorrigible smugglers.

To supplement materiel ordered from the United States, which had not reached Rangoon, the Public Health Service group resorted to purchases in the bazaars of Burma and India, but a rapidly developing shortage of supplies throughout Southeast Asia limited their success. The American Red Cross turned over great quantities of their reserve medical and surgical supplies, generously tiding the group over many an emergency.

MILITARY REVERSES IN BURMA

By March 1942, Rangoon had fallen, and the Japanese were advancing steadily northward. There was little defense against their ubiquitous bombers. The group lived in an ominous atmosphere of grim anticipation. All around them the civilian structure of Burma was disintegrating. As cities to the south were progressively evacuated, thousands of refugees streamed north by means of any conveyance procurable. Private life ceased to exist. The Service officers were helping to build a railway that went nowhere. It had been intended to supply China via Burma, but Burma could no longer supply itself. As long as the Chinese Government insisted on construction, the group had to stay on the job; although their efforts were merely "sound and fury, signifying nothing," they did not slacken until ordered to stop.

(From USPHS Records)

Dr. Victor H. Haas on India-Burma boundary, 1942. This is the site at which Stillwell Road eventually crossed from India to Burma.

(From USPHS Records)

Between Paoshan and Kunming, China, during the eviction of Allied Forces from Burma, 1942. Dr. Victor H. Haas has his hand on boy's shoulder; others are Dr. Thomas H. Tomlinson, Mr. Gordon E. Smith (with submachine gun), and Pharmacist Carl Gohman (face concealed by helmet). Sitting on the ground in the center is Mayu-chi, Chief Sanitary Engineer of the Chinese group working with the American Medical Commission.

In February, General Chiang Kai Shek had come to Lashio and had sent for Major John E. Ausland, the American engineer adviser to the Railway, and Doctor Haas. He told them that he wanted to build a highway from Northern Burma to Assam, where the railway from Calcutta terminated at Ledo. This plan was predicated on the assumption that the Allies would hold Upper Burma indefinitely.

Four of the group, Daniel Wright, Lawrence Hall, Frederick Thomas, and Edward Lacey, went to Mogaung, near Myitkyina, to begin the malaria control and camp sanitation required for the new highway project. Doctor Manget traversed the proposed line of construction as far as the foothills below the Burma-Assam border; Doctor Haas also went up a part of this line.

THE FALL OF BURMA

Catastrophe came when the Chinese VI Army collapsed on the allied left south of the Shan Plateau. Lashio was abandoned, and the Public Health Service group set up headquarters in a large warehouse at Haenwi, 35 miles up the Burma Road. For three days, Dr. Thomas Tomlinson, Carl Gohman, Joseph Pasterski, and Major Ausland returned repeatedly to Lashio or its outskirts, snatching away such supplies as they could before the Japanese consolidated their advance.

About 50 Chinese colleagues were in danger of being cut off on the Railway's Division I. With two trucks, Doctor Stevenson and Frank Fisk made a dash of 100 miles and got them out and back to the Burma Road before the Japanese reached the junction. This dash involved not only a race with the Japanese, but a blind faith that someone would be on hand to operate the ferry across the Salween River. It was a close call.

For two weeks the lives of the group were a long nightmare of retreat. Before the fall of Burma, the entire group had been assigned to Lieutenant General Joseph W. Stilwell's command, and their movements during the latter days of the Burma activities and during the retreat, had been sanctioned by Major General Thomas G. Hearn, Stilwell's chief-of-staff. In Kunming, at the end of the Burma retreat, they reported to Colonel Edward E. McMoreland, and from then on they acted entirely under direct Army orders.

ASSIGNMENTS IN THE CHINA-BURMA-INDIA THEATRE OF OPERATIONS

In May 1942, after flying to India over the "Hump," Doctor Haas reported to Major General Raymond A. Wheeler, commanding the Service of Supply in the China-Burma-India Theatre. General Wheeler gave the Public Health Service group a warm reception, and stressed his wish to provide adequate preventive medicine for all American military forces. He was sincerely convinced of the effectiveness of preventive medicine and repeatedly gave Doctor Haas his personal backing.

The Army scattered the group like leaves. Doctor Tomlinson went the farthest, from Chungking to Eritrea, eventually serving at Delhi as Deputy Theatre Surgeon for the Service of Supply. The rest were spread from Kunming to Karachi, from Assam to Bangalore. Though initial difficulties were encountered during this assimilation into the Army, in the absence of precedent in such matters, these problems eventually were resolved satisfactorily, and the members of the group continued to be able to make substantial contributions to the campaign in the China-Burma-India Theatre of Operations.

This period was one of construction of many airfields and supply depots to sustain and expand the flights over the "Hump." The establishment of these bases was largely the function of the Service of Supply, and Public Health Service officers assigned to that organization provided for sanitation, preventive medicine, malaria control, and medical supplies at important installations.

Dr. Paul Stevenson, Dr. Gordon Smith, and Mr. Joseph Pasterski were at Ramgarh, where General Stilwell trained his Chinese armies for the reconquest of Burma. Most of the others served at air bases or major Service of Supply headquarters. Members of the group filled a critical gap, pending the eventual arrival from the United States of units and individuals trained in the various specialties of preventive medicine. There were ultimately many officers trained in malariology, dietetics, venereal disease control, veterinary medicine, sanitary engineering and so on. But for more than a year after the arrival of American forces in the China-Burma-India Theatre, the Public Health Service supplied the only Medical Department officers trained and experienced in preventive medicine.

THE LEDO ROAD

In November 1942, Doctor Haas was sent to Ledo, up in the northeast tip of India. This was the "hotspot" of the China-Burma-India Theatre, from which General Stilwell had decided to jump off for the reconquest of Burma. This operation was classified as "Most Secret," designated only as "Operation X," and even the use of the word Ledo was forbidden.

Major General Wheeler and the Ledo Commander, Colonel (later Brigadier General) John C. Arrowsmith, made a personal reconnaissance forward of Ledo into Burma in early December, accompanied by Doctor Haas. They saw the remains of the tragic flight from Burma. There were hundreds of skeletons along this trail, the bones picked clean by the ants. Many lay about the ashes of old camp fires, or beneath the remains of crude shelters thrown up beside the path. Others were clustered about the streams where drinking water was obtained. Some were sprawled in the trail, face down; these must have died as they fell, unable to take one more step. No words could exaggerate the tragedies that occurred along these trails in the spring of 1942. Doctor Haas was appointed Surgeon for the Ledo operation of the Service of Supply, a staff position at General Arrowsmith's headquarters, serving in this capacity until his return to the United States almost a year later.

When Doctor Haas was assigned to Ledo there were only 10 or 12 Americans there; they stayed in an abandoned bungalow on a tea plantation. The meals were very crude. When he left Ledo there were more than 100,000 troops and labor battalions in the operation. There was an officers' club, and even two Chinese restaurants across the road from headquarters. In the fixed base at Ledo, some 12 miles long and two to three miles wide, malaria control under Dr. Gordon Smith had progressed to the stage where Lt. Col. Thomas Fitzhugh, chief of medicine of the glamorous 20th General Hospital from the University of Pennsylvania, told the staff that through the efforts of the U. S. Public Health Service staff the Ledo valley had been made as salubrious as Robin Hood Dell.

Philippine Islands—1941

In 1941, six officers of the Service were on duty in the Philippine Islands, to conduct the quarantine service of the Philippines and also

to provide medical care to beneficiaries of the Service, chiefly merchant seamen from American vessels and personnel of the Coast and Geodetic Survey. These officers were Drs. Howard F. Smith, in charge, Fred J. Black, Virgil J. Dorset, James A. Grider, Floyd A. Hawk, and Albert N. Sarwold; all were on duty in Manila, except Doctor Hawk, who was in charge of the quarantine station at Cebu.

During the latter part of 1941, all American families in the Philippine Islands were advised to return to the United States. The families of Service officers complied with these instructions.

The Philippine Islands were attacked by the Japanese on December 8, 1941. On December 15, 1941, Doctor Hawk offered his services to Brigadier General William F. Sharpe, in charge of American forces in Cebu. At General Sharpe's request, Doctor Hawk reported to Colonel William F. Braddock of the Medical Corps of the Army for duty. All available supplies under Doctor Hawk's charge at the quarantine station were immediately requisitioned.

As the Japanese invasion of the Philippines progressed, the American forces in Cebu realized that capture was inevitable. There was considerable discussion among some of the Americans as to what would be the most effective thing to do. Many felt that rather than surrender it would be better if they went into the woods and joined the guerrillas to harass the Japanese. Doctor Hawk took part in these discussions. At that time he was attached to a hospital in Cebu in which there were about 100 critically ill patients. Some of the officers on duty with him attempted to persuade him to go with them to the hills. They felt that he could be of more service giving medical care to the guerrilla forces in outlying areas. After carefully considering the matter, he deliberately chose to stay in the hospital to take care of his patients. Doctor Hawk and Colonel Dwight M. Deter of the Medical Corps of the Army were the first white prisoners to be captured by the Japanese on the Island of Cebu.

Major General Edward P. King surrendered Bataan to the Japanese on April 9, 1942. Major General Jonathan M. Wainwright surrendered Corregidor on May 6, 1942. Cebu fell shortly thereafter. Doctor Hawk was taken prisoner and was interned in the Provincial jail in Cebu. A few weeks later he was sent, together with the other military prisoners,

to Camp No. 2 at Davao, Mindanao, Philippine Islands. In 1944 he was transferred to the Cabanatuan Prison Camp. He remained at Cabanatuan for about six months, and was then transferred to Bilibid Prison about the middle of November 1944. It is known that about this time Doctor Hawk was suffering from inflammation of the optic nerve (optic neuritis of nutritional origin). He was sent from Bilibid Prison on December 16, 1944, to Japan, on the *Agua Maru,* a cattle boat, as one of the 1,620 prisoners of war on board. In Subic Bay a direct hit was made on this ship by American dive bombers, apparently mistaking it for a Japanese troopship. The ship was sunk but as the bombing occurred near the shore, very few of the American prisoners were lost. They were then transferred to another ship and sent on to Formosa. While they were in port somewhere in Formosa, they were again bombed by American planes and this time there were many casualties. Of the 1,620 prisoners aboard when the *Agua Maru* left for Japan on December 16, between 200 and 300 arrived in Japan, most of them in poor physical condition. Upon arrival the prisoners, wearing only their tropical shorts, were marched through the streets in a blizzard. Doctor Hawk was transferred to Fukuoka, Kyushu, where he died 12 days later of exposure and malnutrition. His death is recorded as of February 8, 1945.[1] The official records show that he died of avitaminosis, or, expressing it less technically, he was starved to death.

With the Japanese invasion of the Philippines under way, Dr. Fred J. Black, in company with Drs. Virgil J. Dorset, James A. Grider, and Albert N. Sarwold, reported to the commanding officer of the Sternberg General Hospital of the Army in Manila on December 25, 1941. That night, Doctor Black was transferred to Bataan. He served there in Hospital No. 1 until April 6, 1942, when he was transferred from Bataan to Corregidor as a patient. This was a day or so before Bataan fell. After the surrender of Corregidor on May 6, 1942, he was taken to Bilibid Prison in Manila and remained there about one year. At this time Doctor Black was sent to Cabanatuan. The food and general conditions in this camp were vile. Doctor Black is known to have suffered from

[1]Doctor Hawk was born in Pennsylvania and reared in Indiana. He received his medical degree from the University of Indiana in 1932. His internship was taken with the Service. He then entered the Regular Corps.

beri-beri and amoebic dysentery during the latter part of his stay at Cabanatuan.

Doctor Black was transferred from the Philippines to Japan in October 1944 by Japanese transport. While in the South China Sea, about 200 miles off the coast of China, this Japanese transport was sunk by a United States submarine. Of the 1,775 American prisoners on board, only five survived. Doctor Black was among those lost.[2]

After reporting to Sternberg General Hospital, Dr. Virgil J. Dorset was transferred to Bataan on December 26, 1941, where he served with the United States Army Bataan General Hospital No. 2 under the command of Colonel Carlton L. Vanderboget, and later Colonel James O. Gillespie. Doctor Dorset served as Chief of the Medical Service until the surrender of Bataan on April 9, 1942. Following the surrender, Doctor Dorset was transferred to the Prisoner of War Camp at Cabanatuan where he remained for almost two years. During the time he was in Cabanatuan he performed medical duties for the prisoners in the camp, as did Doctors Sarwold and Black. This work was attended with great difficulties, including lack of food, drugs, and other medical supplies.

In February 1944, Doctor Dorset was transferred to Japan. Upon arrival in Japan, he was assigned to a Prisoner of War Camp at Ube, a city on the southern end of the Island of Honshu. There he was assigned to medical duties. Because of incendiary air raids and subsequent damage to that camp, the prisoners were transferred to Motoyama Camp on July 7, 1945, where Doctor Dorset was again assigned to medical duties. He continued there until liberated by United States forces in September. Doctor Dorset was evacuated by train to Wakanoura on September 14, 1945, sent to Manila, and then returned to the United States.

Dr. James A. Grider, after reporting for duty with the Army on December 25, 1941, was assigned to the Sternberg General Hospital in Manila. That same evening Manila was suddenly evacuated by the U. S. Army. Doctor Grider went with the Army to Bataan where he remained until the fall of Bataan on April 9, 1942. Doctor Grider

[2]A native of Pennsylvania, Doctor Black received his medical degree at the University of Michigan in 1932. Following his internship, which was taken with the Service, he entered the Regular Corps.

entered the Cabanatuan Prison Camp in the Philippine Islands on May 31, 1942. He was transferred to Fukuoka in Japan on January 21, 1944. He remained there until September 23, 1945, when he was liberated by American troops. Doctor Grider returned to the United States on October 6, 1945. For most of the time that Doctor Grider was a prisoner of war he was engaged in medical work; however, for a few weeks late in 1943 and early in 1944, he was required to do some pick and shovel construction work at a Japanese air field. For a few months previous to that he was required to work as a laborer on the camp farm, as were Doctor Sarwold and Doctor Black.

Upon reporting to the commanding officer of the Sternberg General Hospital in Manila on December 25, 1941, Dr. Albert N. Sarwold was promptly assigned to duty. That evening the hospital was evacuated to the jungles of Bataan, where in a few days Hospital No. 2 was organized. Doctor Sarwold served as Ward Surgeon. The hospital patient load varied from 2,000 to 6,000. After the surrender at Bataan on April 9, 1942, he remained at the hospital until about May 22, 1942, when he was taken to Bilibid Prison in Manila. After a few days he was sent to Cabanatuan Prison Camp in the Philippines, arriving there on June 1, 1942. He remained in that camp until November 18, 1944, at which time he was again transferred to Bilibid Prison in Manila.

Conditions in the Cabanatuan Camp were inconceivably bad. The diet was very inadequate and medical supplies were practically non-existent. During Doctor Sarwold's stay in that camp, his weight went from a normal 165 pounds to 103 pounds. About December 1, 1944, he was transferred to the McKinley Prison Camp, a few miles outside of Manila. On January 4, 1945, he was transferred back to Bilibid Prison in Manila and remained there until liberated by the American Army on February 4, 1945. He arrived in the United States on March 16, 1945.

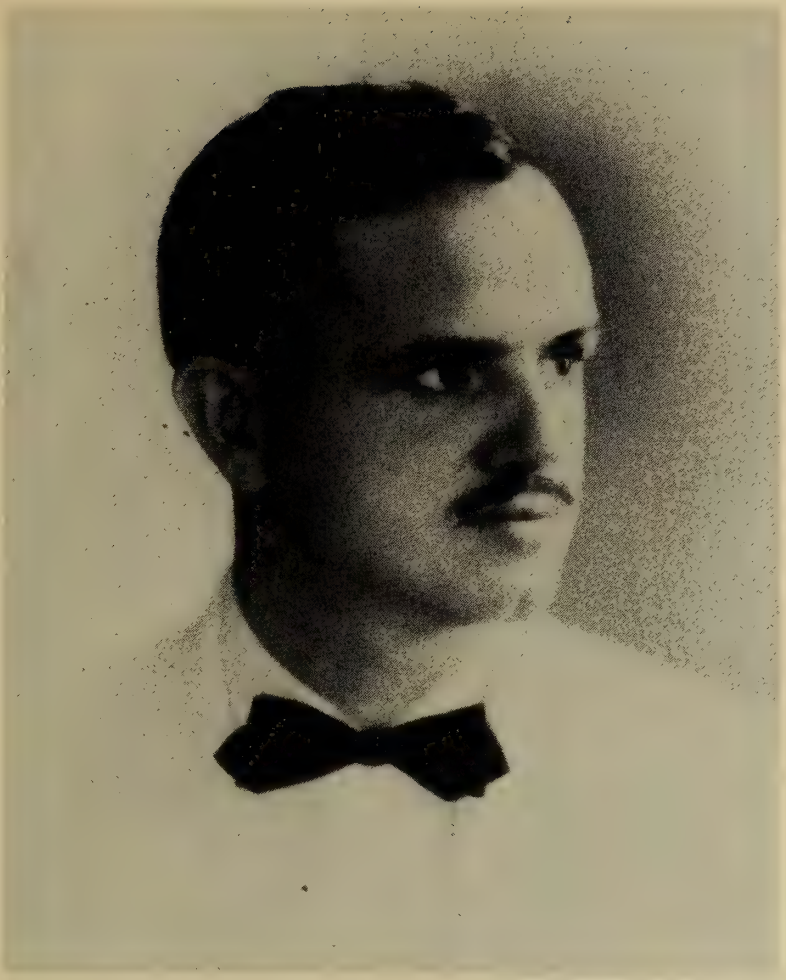
Service Officers on Duty in North Africa

Complying with a request from Mr. Robert Murphy, Chief Civil Affairs Officer of the State Department in North Africa, Drs. Dudley A. Reekie, Dorland J. Davis, and Michael L. Furcolow were detailed on February 26, 1943, to serve as medical officers with the American Mis-

sion on North Africa. The purpose of this assignment was to assist in procuring and distributing medical supplies to the civilian population, to be medical advisers in relief and rehabilitation activities, and to survey the prevalence and distribution of epidemic diseases which might menace the military forces. Upon arrival in Algiers, Algeria, in the last week of March 1943, they were assigned as the medical section to the Division of Public Welfare and Relief of the North African Economic Board under the Allied Forces Headquarters. Soon after arrival, the Theatre Commander of the U. S. Army attached these Public Health Service officers to the Surgeon's Office to serve as liaison between that office and the North African health authorities in matters pertaining to the health of the Armed Forces. Two other officers of the Public Health Service, Dr. Alfred L. Frechette and Louis L. Fittro, a sanitary engineer, arrived in July and joined the Medical Section.

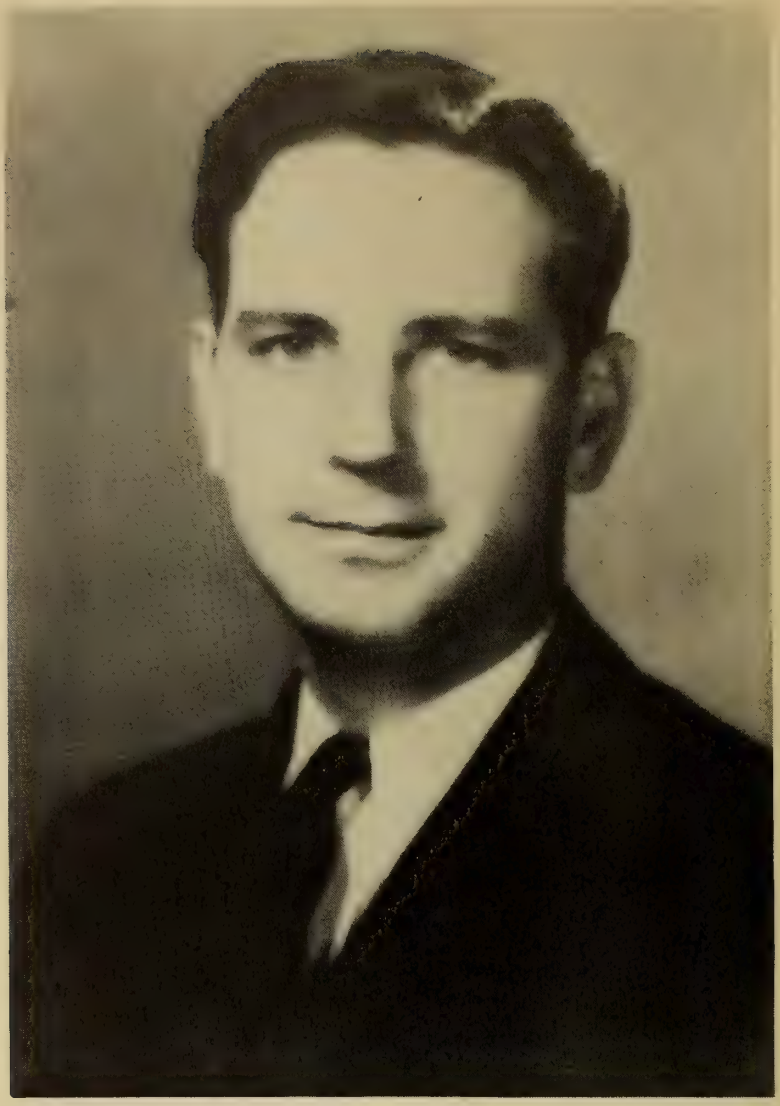
Doctor Reekie, as chief of the Medical Section, reviewed the immediate need for medical supplies for all North Africa, particularly atabrine, and arranged for emergency supplies. He acted as consultant to both the Allied Force Headquarters and the North African health authorities in problems dealing with malaria, venereal diseases, civilian sanitation, and disaster relief. Later he made a trip to the Middle East to observe the problems of refugee care, then being done on a large scale in Egypt.

Soon after arrival in Algiers, Doctor Furcolow was detailed to the Army to serve with the liaison section of Allied Force Headquarters, later called the Military Government Section. It was composed of French, British, and American representatives for the military government of occupied territory. Doctor Furcolow arrived at Le Kef, which was the provisional capital, about the time that the British Eighth Army had advanced into Tunisia in April 1943. He was the physician member of a group made up of an administrator, a police official, a medical officer, and a State Department representative. This group was to assist the French in setting up the government of Tunisia after the territory had been recovered from the Germans; the duties of the medical officer were to go in with the troops to determine the status of hospital beds, the presence of epidemic diseases, and the need for medical supplies and to assist in the procurement of necessary health supplies.



(Courtesy Mrs. Floyd A. Hawk)

Dr. Floyd A. Hawk



(From USPHS Records)

Dr. Fred J. Black

Doctor Furcolow went to southern Tunisia and moved into the cities as they were occupied by the British Eighth Army. This procedure was followed up the coast, entering Tunis the day after the first troops entered and going to Bizerte the following day. After the surrender of the Germans, civilian health departments were reestablished and surveys made of the displaced persons, the needs for medical and Red Cross relief, and also some surveys of the nutritional status of the population.

This work was shortly interrupted by secret orders to Doctor Furcolow to proceed to southern Tunisia, where he embarked with the expedition to invade Pantelleria on June 10, 1943. This was the first bit of enemy homeland that was actually occupied by allied troops in the war. On Pantelleria, Doctor Furcolow was in effect the Chief Medical Officer, responsible for the public health and medical care of the civilians. He then was sent to Algiers and to Morocco for a survey of the status of medical supplies for civilians. In November, he joined the team engaged in typhus control for a demonstration of the value of DDT as dusting powder for body lice. With this team, he went to Palermo, Sicily and the surrounding area.

Upon arrival in North Africa, Doctor Davis made a preliminary survey of the needs for medical supplies, particularly atabrine, for the civilian population in Morocco. Later he was requested by the city of Oran, Algeria, to make a survey of the public health problems and available facilities of that city. The report of this survey was to serve as a basis for the reorganization of the health activities so as to be more effective in supporting the preventive medicine program of the Allied Armed Forces in that vicinity. He also was requested to assist and advise the Armed Forces in connection with the disinfestation of airplanes arriving in North Africa from Central and West Africa to prevent the introduction of infected mosquitoes or new vectors of malaria.

In October 1943, the Surgeon of the North African Theatre of Operations, U. S. Army, requested Doctor Davis to investigate the status of yellow fever, particularly, and other diseases in East and Central Africa with the view of assessing their danger to the Armed Forces. Upon his return to Algiers, he went to Morocco and arranged for the medical care of refugees expected to arrive from Spain.

Doctor Frechette was assigned to Tunisia as chief of the Division of Public Welfare and Relief in that area and completed surveys of needed supplies begun by Doctor Furcolow. This office stimulated the Tunisian health authorities to expand their anti-malarial work, assisted in planning the reconstruction of the destroyed water and sanitation systems of the war-torn communities, and arranged for emergency medical supplies for displaced persons. Mr. Fittro, the sanitary engineer, was also assigned to Tunisia to assist in sanitary engineering problems.

With the close of the year 1943, the immediate problems of relief and rehabilitation in North Africa were ameliorated or the solutions planned, and organization was begun for activities in other areas, notably Greece, under the United Nations Relief and Rehabilitation Administration, which was activated about that time. Public Health Service personnel were accordingly returned to the United States and reassigned early in 1944.

Officers Assigned to Mediterranean and European Theatres

A contingent of Service officers was sent to the School of Military Government of the U. S. Army at Charlottesville, Virginia, for training and planning, in January 1943. In this group were Drs. Joseph A. Bell, Hiram J. Bush, Edgar B. Johnwick, and Leonard A. Scheele.

In May 1943, another group consisting of Drs. Robert L. Cherry, Emeric I. Dobos, John A. Lewis, and Sanitary Engineer Vincent B. Lamoureux were assigned to the School of Military Government. In the fall of 1943 Drs. Harold R. Sandstead, Lynne A. Fullerton, and James G. Telfer attended the School.

After training at the School of Military Government, Charlottesville, Dr. Scheele was selected to be the public health member of a nine-man planning team consisting of an attorney, a financier, a public safety official, an economist, and others. This group was flown to Africa to become members of the 141 Force Headquarters staff in Algiers, Algeria, in May 1943. Doctor Scheele and one other member of the planning team were flown on May 15, 1943, in a separate plane to Scotland and thence to Allied Force Headquarters in Algiers and Bousserea as couriers carrying special documents, photographs, and plaster reliefs to be used

in the Sicily invasion planning. Within a few days, they moved to Chrea, Algeria (in the Atlas Mountains) and were joined by the other members of the U.S.A. planning staff.

The U.S.A. team was joined by its British counterpart and began Italy Military Government planning under Major General Lord Rennel of Rodd (United Kingdom), Brigadier General Frank J. McSherry (U.S.A.) and Colonel Charles S. Spafford (U.S.A.). By the end of May, 141 Force became 15th Army Group under General Sir Harold R. L. G. Alexander, with Lt. General George S. Patton, Jr's., Seventh Army (U. S.) and Lt. General Sir Bernard L. Montgomery's Eighth Army (United Kingdom) as its Force.

Drs. Edgar B. Johnwick and Joseph A. Bell left the United States in July and August 1943, respectively, landing in Oran, Africa. From there the Civil Affairs detachment of the Army to which they were assigned moved to Chrea, near Algiers, where they remained for a short period of indoctrination. They were sent to a staging area near Bizerte. The Civil Affairs detachment later moved with the Third Division to Sicily when that island was invaded. Because of the shortage of Civil Affairs officers, the activities of these officers frequently included all of the civil affairs activities as well as public health work.

The team to which they were attached landed in Licata, Sicily, on July 10, 1943. Doctor Bell was assigned to the American Military Government in Occupied Territories in Agrigento Province. Doctor Johnwick was sent to Canicatti. Within a short time, with other members of the mission, they moved forward with the invasion of the mainland of Italy by the British Eighth Army, crossing the Straits of Messina on September 3, 1943, four days before the entry of United States troops on the Salerno beachhead. Doctor Johnwick remained at Reggio for some time on duty with the Public Health Unit of the Civil Affairs Branch.

Doctor Scheele moved with the Army Group G-5 staff to Augusta, Sicily, and then to Palermo. The public health operation in the Army Group was under a British officer, Colonel D. Gordon Cheyne. For a time Doctor Scheele was his deputy.

On September 8, 1943, Italy surrendered and became a "co-belligerent." Before this time the Allied Control Commission was activated.

Doctor Scheele transferred to the Headquarters Public Health and Welfare Branch of that organization in the fall of 1943. He served as Army Group liaison officer and chief of field services. Later he moved to Naples to set up the initial Public Health and Welfare Branch office of the Allied Control Commission there.

Doctor Bell, after remaining in the southern part of Italy for a time, was sent on to Naples to be a member of the Allied Control Commission staff during the epidemic of typhus fever there later in 1943 and early in 1944. He was transferred from Italy to London in February 1944. Doctor Johnwick also came to London shortly thereafter.

Doctor Scheele was chosen by Brigadier General Julius Holmes, General Eisenhower's American G-5 officer at AFHQ, and Brigadier General Frank J. McSherry (American) 15th Army Group G-5, to accompany them to London to be a part of the G-5 staff of the newly established Supreme Headquarters Allied Expeditionary Force commanded by General Eisenhower. Doctor Scheele departed from Naples in January 1944.

Some of the other officers mentioned previously who had received training at the School of Military Government arrived in Algiers in October 1943. Dr. John A. Lewis was sent on to Palermo, Italy, within a month or six weeks. Brigadier G. S. Parkinson, a British officer, arrived in Africa in October as Director of the Public Health and Welfare Sub-Commission, a unit of the Allied Control Commission formed to work with the newly established Italian Government.

Most of the Service officers served with the American Military Government first, and then when the Allied Control Commission took over, they went with that organization. Doctor Dobos served as Regional Medical Officer for Sardinia; Doctor Cherry took over Doctor Scheele's duties as Chief of the Preventive Medicine Section; and Doctor Lewis functioned as Venereal Disease Control Officer and later as Provincial Public Health and Welfare Officer for three provinces in Italy. Sanitary Engineer Lamoureux was assigned to Egypt as Assistant Chief of the Balkan Mission, and later as Chief Sanitary Engineer of the Italian Mission for UNRRA.

Public Health Branch of Civil Affairs (G-5) Supreme Headquarters Allied Expeditionary Forces (SHAEF)

The U. S. Military Government staff in London was redistributed in January 1944, and a new organization, namely, SHAEF G-5, was created to plan and operate Military Government Civil Affairs in Northwest Europe. Soon the British and American planning staffs were brought together; however, there were no British medical personnel in SHAEF until May 1944. Doctor Scheele served as Chief Medical Officer of the SHAEF G-5 Government Affairs, Public Health Section, until late in April 1944. It was found that the low place of the Public Health Section in the organization hampered its work, and Doctor Scheele and Colonel Thomas Turner of the Army made a survey of the problem. As a result of their report a Public Health Branch of SHAEF G-5 was created, and a request was made to Washington to provide a general officer trained and experienced in public health administration to head this Branch, which reported directly to the G-5. At General Holmes' command Doctor Scheele activated the Branch and was its acting head until Dr. Warren F. Draper arrived in London on May 8, 1944. When first assigned to this duty Doctor Draper held the grade of Brigadier General; later, through special authorization by Congress, he was promoted to the rank of Major General. This assignment was made at the request of Secretary of War Henry L. Stimson. Dr. Leonard A. Scheele was chosen by Doctor Draper to head the Preventive Medicine Section of the Branch because of his special knowledge of that subject, and due to his previous experience in civil affairs in Africa and Italy. Doctors Draper and Scheele were the first two officers of the Public Health Service assigned to SHAEF and to the Public Health Branch.

The organization of the Army prior to World War II consisted of four main Staff Divisions through which all of the multitudinous activities were coordinated. These were designated as the G's. G-1 had to do with personnel; G-2, with intelligence matters and security; G-3, with operations, planning, and training; and G-4, with supplies and transportation.

As World War II progressed, it became apparent that populations in countries where fighting was going on might be overrun so fast by our

invading armies, that the destruction and disruption of civilian life and institutions would be so great as to slow our progress and impede our fighting personnel. Moreover, there was reason to believe that the Germans might have depleted and abused a part of the civilian population which would require drastic emergency measures both as a military and as a humanitarian necessity.

It was for these reasons that a new Staff Division of the Army, known as G-5 Civil Affairs, was established and organized. Its function was to deal with the problems of civil governments and civilians as fast as they were found or created, with the prime objective of furthering military effort by meeting emergency needs and maintaining civilian institutions.

When the Allied Armies occupied enemy territory, the role of Civil Affairs changed and became known as Military Government. Whereas the functions of Civil Affairs were largely to advise and assist in the reestablishment of civilian government in liberated countries, the purpose of Military Government was to supervise and control the reorganization of civil government in occupied enemy territory. This implied greater authority and responsibility, and included the removal of Nazis from responsible positions in Germany, the elimination of Nazi influences, and efforts directed toward orienting the Germans toward a democratic form of government. As a result of this policy, it was necessary to replace many German health officials and to rebuild the structure of public health.

Into Civil Affairs for European operations were recruited some 6,000 officers and enlisted personnel carefully selected on the basis of their knowledge or aptitude in the various fields of civil administration—administrators, financial experts, legal advisers, economists, supply officers, security and police authorities, fire officials, public health authorities, public welfare officers, public relations officials, and others.

After a period of intensive study and training for several months in Shrivenham, England, and elsewhere prior to and after D-day, the Civil Affairs personnel were divided into groups of varying numbers. The largest consisted of 40 or 50 members to be held in readiness to go to the larger cities as they were recovered. There they would do what was necessary to reestablish local government, reassure the people, gain their confidence and cooperation by arranging for supplies to meet their

immediate critical needs, and by making plans for the days ahead. Such a group might include one or more officers in each of the various specialties depending upon the needs of each particular place. Smaller groups were organized for smaller cities, and still smaller groups for towns and rural areas where the needs were relatively simple. In some places, for example, two Civil Affairs representatives might be all that were necessary to get things back in shape. If conditions required the services of a health officer or other specialists for a brief period of time, they could be borrowed from one of the larger groups in the field or requisitioned from a group not yet called out.

As the needs of the civil population were usually most acute when the allied troops entered the localities, it was essential that Civil Affairs personnel be present on the spot. Thus, it was that certain numbers of such personnel accompanied the troops on D-day. Others were available to enter communities well before the fighting ceased. Casualties among this personnel were therefore unavoidable.

The public health organization of the G-5 Civil Affairs Division at Supreme Headquarters varied somewhat as to the needs but consisted for the most part of some 14 officers and 12 enlisted personnel. The general plan for Supreme Headquarters called for American and British personnel in almost equal numbers, but public health officers from the British Army were very difficult to find. The only British public health officer on the Supreme Headquarters staff was the Deputy Chief of the Branch, Brigadier Thomas F. Kennedy. He was a man with 30 years of public health experience in the Royal Army Medical Corps. By virtue of his broad background, knowledge of public health, and exceptional skill in developing and maintaining the finest of working relationships, he compensated in part for the shortage.

The staff consisted of Dr. Warren F. Draper as Chief, and the Deputy Chief Brigadier Thomas F. Kennedy as administrative officers, an executive officer, Colonel William L. Wilson of the U. S. Army, and highly competent specialists in communicable disease control, venereal disease control, nutrition, sanitary engineering, public health nursing, narcotic drugs control, veterinary disease control, and general health inspection. In addition, there were three nutrition teams of three

members each assigned to work in the field under the direction of the specialist in nutrition at Headquarters.

It was the responsibility of the Public Health Branch to formulate public health plans and policies to be issued by SHAEF for the instruction and guidance of the Commanders of the various army formations in the field to enable them to meet emergency health requirements of the civil populations under the commands. It was likewise the duty of this Branch to make field inspections to see that these policies were carried out.

One of the most important functions was to develop a system of reporting communicable diseases throughout the liberated countries and to some extent in Germany. It was highly important to have current and accurate information as to significant outbreaks of disease, to distribute this information to the military and civilian authorities concerned, and to institute early and effective action for control. The Civil Affairs officers and the officers of the Medical Department of the Army, who were widely dispersed throughout European countries, were the principal sources and information and constituted a very good communicable disease intelligence service. They played an important role in preventing the development of epidemics which had been forecast and feared as an inevitable consequence of the war in northwest Europe.

Another important duty was to prepare plans and instructions for the health and sanitation measures required in the handling of some 6,000,000 displaced persons as they took to the open roads immediately upon liberation from the farms, factories, and concentration camps of Germany. A special organization in the Civil Affairs Division at Supreme Headquarters known as the Displaced Persons Branch was charged with this over-all responsibility. It depended upon the Public Health Branch for policies and technical advice. The displaced persons were collected as rapidly as possible at assembly centers previously planned and set up for the purpose. There they were fed and cared for pending arrangements for their transportation to the countries from which they had been impressed as slave labor for the Germans.

Once the displaced persons reached the assembly centers, systematic handling was possible. The rapid repatriation of some 4,000,000 out of

the total of 6,000,000 displaced persons was one of the notable administrative feats accomplished during the war.

Small foci of disease, especially typhus fever from the concentration camps, appeared at many different points and had to be promptly dealt with to prevent epidemic spread of that disease. Physical examination and DDT dusting stations were established at crossing points along the Rhine where all who came were adequately treated. Many thousands of displaced persons, refugees, and military personnel were dusted at these stations.

The Public Health Branch furnished the Civil Affairs Supply Branch advice as to medical, sanitary, and food supplies—the kinds and quantities needed, and the times and places where they should be delivered. Had it not been foreseen a year in advance, for example, that the typhus situation in Germany would require a million pounds of DDT, and had it not been requisitioned, manufactured, and brought from the United States in time to be transported by Army trucks for hundreds of miles through France and Belgium so as to be readily available at numerous distribution centers near the German border when the concentration camps were opened up, the several thousand active cases of typhus fever found by the medical officers of the Allied Forces in Germany might have created the definite threat of an epidemic.

Advice in regard to the emergency food supplies required by the civil population from military stocks was a matter of vital importance when the only supplies were those that were brought across the English channel and landed on open beaches, at a time when every cubic foot of space was desperately needed to bring ammunition, food, and equipment to keep the armies going and feed the fighting men up front. Sound advice required accurate knowledge of the nutritional status of the people and the kinds and quantities of emergency food required to meet the most desperate needs. The responsibility for making these determinations was placed upon the shoulders of the nutrition member of the staff, who with several assistants and nutrition teams, ascertained the facts by scientific methods and courageously stood by his recommendations.

Other functions were to coordinate actions of the Public Health Branch of Civil Affairs with the Medical Department of the Army through the Chief Medical Officer of SHAEF and the Chief Surgeon,

European Theatre of Operations; also to work out agreements and maintain cooperative relationships with other agencies—U. S. Typhus Commission, American and British Red Cross, and United Nations Relief and Rehabilitation Administration.

The Civil Affairs public health personnel in the field consisted of approximately 175 officers—medical officers, sanitary engineers, dental officers, nutritionists, entomologists, veterinarians, and others. As already stated, they were assigned to field formations and served as members of the Civil Affairs Detachments which went to the various places and helped the civilians to meet their needs. Such Civil Affairs personnel were always subject to the order of the military commander of the area in which they served. Once having been assigned to a field commander they no longer received their direction from Supreme Headquarters except by way of the general policies and directives which were handed down through their commanders.

When first organized the Civil Affairs Division maintained its personnel in England in several groups located at four different areas. After the invasion, it was removed to France. Time was devoted to training, absorbing the general military customs and procedures, acquiring knowledge of the condition and the people in the countries to be liberated, and of Germany, and receiving the limited amount of professional instruction available. It was the function of the Division to sort and appraise the Civil Affairs personnel and organize it into units of various size and composition in readiness to meet the anticipated needs. Thus, in consultation with a representative of the Public Health Branch, certain public health personnel were made available to serve as its consultants. Two officers were selected as Chiefs of the Public Health Branches in the SHAEF missions to the Netherlands and Belgium. Still others became members of the Civil Affairs detachments to be called forward by the military commanders as operations in the field required.

The Russian, British, and United States agreement at Yalta and Teheran provided for an Allied Control Council for the government of conquered Germany. The United States Group Control Council was organized in October, 1944, with General Eisenhower as its commander in a separate capacity from his duties as Supreme Commander of Allied Forces. The task of the U. S. Group Control Council was to implement

the policies of the United States, negotiate allied agreements on such implementation, assure that SHAEF's operation did not conflict with United States policy, and facilitate a smooth flow of Government procedures throughout all phases of occupation from early military government to eventual passive control. Doctors Bell and Johnwick were assigned to the U. S. Group Control Council at its inception and took charge of the public health and preventive medicine functions of the Group. They prepared the operating directives for control of the German public health organization and secured allied agreements thereon. From the beginning of military occupation in Germany these officers spent much of their time on temporary duty with the Public Health Branch of SHAEF inspecting and assisting field units throughout Germany in handling public health problems of military government and in establishing a German health organization in line with United States policy. In carrying out these functions much was done to prevent the spread of typhus west of the Rhine and to locate and incarcerate German health officials considered to be dangerous Nazis.

As soon as operations in Germany became extensive, the public health personnel available through G-5 in both the American and the British areas were so few in number in relation to the vast requirements of displaced persons, typhus control, and the concentration camps, that they were unable to meet the demands. Thus, the medical services of the American and British armies were compelled to draw heavily upon their own personnel to carry on the burden of the work.

SHAEF missions were organized in England in the early months of 1944 preceding D-day. Their purpose was to serve as liaison bodies between the national governments of liberated countries and the allied military authorities so that each might help the other to the extent that their common interests required. Each mission was administered by an American or British officer especially selected for the purpose. On the staff were special advisers in the major activities of civil government including public health.

In general, each mission was provided with one or two medical officers and a sanitary engineer officer, and to these might be added various specialists for temporary duty as the need arose. The Netherlands Mission, for example, required the temporary services of nutrition con-

sultants, sanitary engineers, and a veterinarian. The Belgian Mission required nutrition consultants and venereal disease consultants. The French Mission had a special need for advice on venereal disease control, veterinary problems, and narcotic drug control.

The public health personnel of the missions established a close working relationship with the health authorities of the national governments, and their activities were of great value to both the civilian and the military agencies. A recruitment program for physicians and nurses was developed in cooperation with the health authorities of the liberated countries and with the United Nations Relief and Rehabilitation Administration. It resulted in the procurement of several hundred such professional personnel who were essential for the control of typhus fever. These and other measures inaugurated and carried out by the Public Health Branch, Office of the Chief Surgeon of the European Theater of Operations, and the United States Typhus Commission, working together in close cooperation, resulted in effective control of typhus in the European Theatre of Operations.

Doctor Draper concluded his work in Europe and returned to duty with the Service in June 1945.

ON THE CONTINENT

Drs. Joseph A. Bell and Edgar B. Johnwick were attached for a time to SHAEF in London. Later, they became members of the United States Group Control Council and were concerned with public health planning and policies for Occupied Territories prior to the invasion of the European mainland. After the Normandy invasion their headquarters were moved to France where they worked closely with the Military Government authorities on public health matters in the occupied territories.

Doctor Scheele was in charge of the Preventive Medicine Section of the Public Health Branch of G-5 at SHAEF headquarters during the entire time from May 1944 until the latter part of 1945. After the invasion of the continent, much of his time was spent in France and other released territories as well as the occupied territories.

Dr. George W. Bolin was tranferred from the United States to London, England, in July 1941. Shortly after his arrival he was attached to the

American Embassy in that city. In August 1944, he was detailed to the United States army in London, being attached to G-5 of SHAEF. After the invasion of the continent, Doctor Bolin conducted rapid nutrition surveys of the civilian population in France, Belgium, and Holland. The purpose of these surveys was to determine whether the nutritional condition of the population required that American supplies be diverted for the relief of those populations. From October 1944 until April 1945 he was on duty with the Military Government, his headquarters being in Neustadt. Later, he was in charge of the Public Health Branch of G-5 in that portion of Germany west of the Rhine and south of the Moselle River. Still later, he was transferred to Wiesbaden where he performed similar duties. Doctor Bolin returned to the United States in December 1945.

Dr. Virgil P. Sydenstricker, Professor of Medicine at the Medical School of the University of Georgia and well-known authority in the field of nutrition, served on active duty as an officer of the Reserve Corps and was assigned to the Public Health Branch of SHAEF. The greater part of his time from February 1, 1944, through June 15 of that year was spent in Holland making investigations of actual and alleged nutritional deficiencies in various areas which were held by the allied armies. During this time Doctor Sydenstricker was sent to the Belsen Prison Camp at the request of the Chief Medical Officer of the British Second Army, where he spent several days planning the rehabilitation of starving prisoners.

Dr. Lynne A. Fullerton served as Chief of the Public Health Branch with the G-5 Mission to Belgium, with headquarters in Brussels. His activities were confined to the Belgian Ministry of Health and Field Marshal Montgomery's Military Headquarters. After the invasion, Dr. Harold R. Sandstead served as Chief of the Public Health Branch with the SHAEF Mission to the Netherlands with headquarters in Eindhoven and The Hague. He gave special attention to nutritional problems resulting from the occupation of Holland by the German forces.

In July 1945 Doctor Scheele was detailed to the Allied Control Council for Germany and accompanied the initial staff of General Lucius D. Clay to Berlin for the Potsdam Conference to serve as head of the Allied Control Council,. Health, Welfare, Education, and Re-

ligious Affairs Branch, during its formative period there. He opened the first health negotiations with the Russians, at General Clay's direction, after arrival in Berlin.

Doctors Bell and Johnwick served in Berlin for a time. They and Doctor Scheele returned to the United States and to duty with the Service during September and October 1945.

Officers With UNRRA Made Available to Army

During the summer of 1944 a number of Public Health Service officers were assigned to the United Nations Relief and Rehabilitation Administration. These officers were dispatched overseas and assigned to the London office of UNRRA anticipatory to service on the continent. At that time, following the Allied break-through after the successful landing in Normandy, it seemed not unlikely that there would be a collapse of Axis resistance. This would have resulted in an immediate full utilization of UNRRA personnel.

Enemy resistance stiffened, the Allies outdistanced their supply lines, and the front became relatively stabilized following the liberation of Belgium, a small part of the Netherlands, and a slight penetration of Western Germany. Furthermore, the French Government indicated that the services of UNRRA would not be required.

These events posed a problem concerning the immediate utilization of the Public Health Service personnel stationed in Britain. Since most of them were eventually destined for service in Germany for the relief of displaced persons, it became increasingly evident that their services might not be needed for a number of months. The desirability was fully recognized of utilizing the services of these highly trained public health medical, dental, and sanitary engineer officers, professional groups who were available in very inadequate numbers in the European Theatre of Operations.

As a result of an agreement between the UNRRA European Headquarters, Portland Place, London, and SHAEF, currently located outside London, these officers were temporarily transferred to the Civil Affairs Staff Division (G-5) of the American Army. The negotiations for the transfer of these officers were facilitated by Dr. Warren F. Draper then serving with the Army.

Because of the shortage of trained public health personnel, SHAEF accepted UNRRA's offer without delay, with the understanding that these officers would be returned to UNRRA when needed. They were sent to France and assigned to Civil Affairs Units in liberated countries or to Military Government detachments in occupied Germany. Others were assigned to G-5 staffs of Corps, Army, and Army Group levels.

On September 10, 1944, the first officers of this group were attached to the Public Health Branch of SHAEF then located in England. One week later these officers were sent to France for duty with the First U. S. Army. The remaining officers were assigned in rapid succession to combat units of the First, Third, Seventh, and Ninth U. S. Armies, usually as members of Military Government Detachments under combat unit control to put into effect plans and policies determined by the Civil Affairs Staff Division. In general these officers performed similar duties, depending upon whether they were on duty at the Division, Corps, or Army levels.

The activities of this group of officers differed from those of officers assigned directly to the Army in one fundamental particular. The officers assigned directly were responsible for, or assisted in, the development of public health policies, practices, and general procedure for guidance of public health activities of all countries of Europe, whereas the UNRRA group carried out public health measures, established public health facilities, and applied epidemic control measures in the areas where they were on duty. One officer served as public health staff specialist with the First U. S. Army to assist the regular staff in formulating policies, investigating, and instituting disease control measures among the civilian population, and temporarily to replace regular Army staff members. The medical officers were used most frequently in the investigation of reported or suspected epidemics, which included typhus fever, typhoid fever, influenza, diphtheria, and dysentery, and in application of necessary control measures among the civilian population of several of the larger cities in France, Belgium, and Germany. One important phase of this work was the investigation of health conditions of communities immediately following liberation.

The duties of these officers were manifold and their experiences interesting. Assigned to Civil Affairs, they were concerned with the re-

establishment of health organizations, the prevention of disease, nutritional problems, the reporting of communicable disease, and determining needs for emergency medical supplies. Within Germany, as part of the Military Government, they were responsible for the reorganization of German health organizations, the care of displaced persons, and prevention of communicable diseases. The reorganization of German health organizations was most difficult because many German health officials had been members of the Nazi party and other organizations which disqualified them for public office. Both in Civil Affairs and Military Government these G-5 officers cooperated with medical officers of combat organizations.

Dr. David C. Elliott was detailed to the 12th Army Group, Displaced Persons Branch. Later, he was sent to Cairo and was mentioned in dispatches of the British Army. Dr. Frank S. Fellows saw duty in South Central France and later at Heidelberg and Mannheim, Germany. Dr. Oswald F. Hedley was detailed to the First Army and for a time served as Health Officer of Cologne, Germany. Dr. Noka B. Hon and Sanitary Engineer Omar C. Hopkins were with G-5 of the First and Third Armies.

These officers were attached to the Army under an agreement that they would be returned to UNRRA when requested. They were assigned to forward echelon units in France and Germany as previously indicated. They performed services comparable to those of other Public Health Service officers and acquitted themselves with distinction. They were eventually relieved from the Army and returned to UNRRA Headquarters in London. Only one of this group returned to UNRRA for active duty following the war period. The remainder returned to the United States within two or three months following the end of the war.

Other Service Officers Assigned to Army

On December 22, 1941, General Douglas MacArthur cabled Surgeon General Parran requesting concurrence in the assignment of Dr. Howard F. Smith as an aide-de-camp on his staff from December 12, 1941. This was given favorable action by Doctor Parran.

When General Douglas MacArthur was evacuated in March 1942 from the Philippine Islands under direct orders of the President, Dr. Howard F. Smith was included as a member of General MacArthur's staff. During the time following the evacuation until the reoccupation of the Philippines by the American forces, Doctor Smith served as a medical adviser on the General Headquarters Staff of the Southwest Pacific in Borneo, New Guinea, and for a time in Australia. His principal duties during this time related to malaria control activities in Borneo and New Guinea. Doctor Smith remained with the Army until September 1945, when he again returned to duty with the Public Health Service.

Commission on Schistosomiasis

In the latter part of February 1945, Surgeon General Norman T. Kirk of the Army requested the assignment of Dr. Willard H. Wright, of the National Institute of Health, to the Commission on Schistosomiasis being formed under the Army Epidemiological Board for a study of the military aspects of the disease in the Far East. The establishment of the Commission was largely influenced by the considerable number of cases of the disease which occurred in units of the Eighth Army following the invasion of the Island of Leyte on October 20, 1944.

During the month of March 1945, the personnel of the Commission held several meetings in Washington, D. C., to determine equipment needs and to prepare a program for its activities. Doctor Wright assumed his duties with the Army on April 1, 1945. The Commission departed from Washington on April 15, and arrived at Tanauan, Leyte, on April 25. A laboratory was immediately established at Tacloban, Leyte.

On its departure from Washington, the personnel of the Commission included, in addition to Doctor Wright, one Army officer, two civilian scientists, and two Army enlisted men. During its period of duty on Leyte, other Army personnel, commissioned and enlisted, were attached to the Commission to assist in its work. Following the return of the Director of the Commission to the United States on August 11, 1945, Doctor Wright assumed the directorship and continued in that capacity during the life of the Commission.

The laboratory studies of the Commission were completed on October 3, 1945. Pursuant to authority from Headquarters, United States Army Forces, Pacific, on October 14, the Commission loaded its equipment and vehicles at San Rocque Beach, Leyte, and departed from Leyte Gulf on October 17. After arrival of the convoy at Yokohama, Japan, on October 24, 1945, the Commission proceeded to Tokyo, where headquarters were established at the 251st Station Hospital. From these headquarters, surveys were conducted of the endemic areas of schistosomiasis in the Sixth and Eighth Army areas on the islands of Honshu and Kyushu, with the view of delineating these areas in order that suitable measures might be taken to prevent the occurrence of the disease in the occupation forces. The surveys in question were completed on December 2, 1945, and the Commission prepared final reports of its work and departed from Tokyo on December 16, arriving in Washington, D. C., on December 23, 1945. Between this date and January 19, 1946, when it was disbanded, the Commission was on duty in the Office of the Surgeon General of the Army in Washington.

Since disbanding, personnel of the Commission have published a total of 20 papers giving the results under the following general headings of its investigations in the Philippine Islands and Japan:

(1) The diagnosis of schistosomiasis;
(2) The epidemiology of schistosomiasis in the Philippine Islands and Japan;
(3) The molluscan intermediate host of *Schistosoma japonicum;* and
(4) The control of schistosomiasis japonica.

Civil Affairs in Philippines

In 1943, Dr. James G. Telfer was assigned to the War Department. Together with a group of Civil Affairs officers, he received special training by the Army at the University of Chicago for duty in the Orient. He was then detailed to New Guinea and, while on that duty, wrote the public health section of the Manual for Civil Affairs Officers in the Philippines. He arrived in Leyte on November 5, 1944, when the United States forces held only the northeastern coastal strip of the island. He made numerous field trips for the Civil Affairs Unit during this period.

He arrived in Santo Tomas Internment Camp in Manila on February

7, 1945. On special orders from General Douglas MacArthur, he came to this camp on a mission having to do with a group of officers and enlisted men who had relatives held prisoners in the camp. This was just before the Japanese subjected the camp to an intensive artillery bombardment. Doctor Telfer remained at this camp as Chief Medical Officer for several months. He performed the necessary surgical work during that period. On March 2, 1945, Major General Guy B. Denit assigned him to the task of reestablishing the Communicable Diseases Division of the Manila City Health Department. Doctor Telfer served in that capacity until August 1945, when he returned to the United States and was relieved from further duty with the Army.

Officers Assigned to the United States Navy

During April 1943, Dr. William W. Nesbit was assigned to Columbia University in the U. S. Navy School of Military Government and International Administration. He pursued the prescribed courses there for three semesters in preparation for Naval Military Government duty in occupied war areas. In February 1944, he was assigned to duty on the staff of Fleet Admiral Chester W. Nimitz, Commander in Chief, U. S. Pacific Fleet and Pacific Ocean Areas.

On Admiral Nimitz's staff, he served in the Medical Logistics Section with primary responsibility for planning, integrating, and implementing medical service for the civilian populations of occupied areas. In this connection Naval Military Government in Pacific Ocean areas constituted a new concept in combat and garrison activities, but from the medical viewpoint it was considered that some medical and sanitary facilities would have to be provided for the needs of civilians and to prevent the spread of epidemic and exotic diseases from the civilian to the military population. Prior to the Gilbert-Marshall Islands campaigns, no specific plans had been made for medical care of wounded or sick civilians due to the urgency of combat preparations.

In view of these circumstances, Doctor Nesbit became engaged in repeated wartime operations of variable magnitude for which there was no specific background or precedent. Civilian medical care and sanitation programs, including the establishment of hospitals, were planned

and carried out in the Marshall, Marianas, Palau-Uluthi, and Okinawa operations. The hazards and difficulties encountered were tremendous because of engagement in island-to-island type of occupation rather than continental or land operations. However, the results obtained through every type of ingenuity, plus modern equipment when it could be obtained and installed, were satisfactory. Rapid economic benefits accrued to the occupational forces. There were great improvements in sanitation and general health conditions, and a reduction in civilian death rates and epidemic diseases. The furnishing of medical care to civilians wounded during combat was an accomplishment which obviated interference with military operations and the tactical medical forces. The Military Government medical personnel were in fact often helpful to those forces during combat phases.

During 1944, it was recognized that naval or other government personnel could not continue to furnish medical care on a long-term basis for the civilians on the innumerable occupied islands after the termination of the war even though there was a great lack of native physicians and nurses. Consequently, a program of training for native medical practitioners and nurses was planned and authorized for establishment on the island of Guam as soon as conditions would permit. The training program for nurses went into effect in late 1945, and the full establishment of the school for native medical practitioners and nurses was planned for early 1946.

On November 2, 1945, Doctor Nesbit was relieved from duty with the U. S. Navy and returned to the Service.

Upon arrival at Pearl Harbor in March 1944, Dr. John L. Wilson was assigned to the Military Government team of the Garrison Forces for the invasion of Saipan in the Marianas. After performing logistics for the medical section of the Naval Military Government, a part of the group was attached to the Fifth Amphibious Corps, which constituted the landing force for the seizure of Saipan. The entire invasion fleet later returned to Pearl Harbor and, after some waiting under alerted conditions, sailed for the Marianas.

Doctor Wilson was a Staff Officer of the Fifth Amphibious Corps, which was composed of 2nd and 4th Marine Divisions and the 27th Army Division, under the command of Lieutenant General Holland

M. Smith. His ship was in the area of the 2nd Division beachhead and, shortly after the invasion started, he was placed in charge of the casualty clearing station of the *USS Sheridan.* They received, within 24 hours, 248 casualties from the 2nd Marine Division.

Later, the medical team was sent ashore and a dressing station was established. Besides the dressing of the civilians the medical section, consisting of Doctor Wilson and one corpsman, had to supervise the immediate installation of sanitary sewage disposal and drinking water systems. Japanese civilians were used in carrying out this work under Doctor Wilson's direction.

The sanitation problems were great. The camp was located on a small island approximately 12 miles long and three and one-half to five miles wide, with 20,000 civilians and three divisions of troops, as well as an unknown number of Japanese troops. Sanitation in the area consisted of teaching the natives to use sanitary facilities. This condition was greatly improved following the engagement when the Military Government was able to open schools for the instruction of the young. Slit trenches were used for latrines, which were covered by boards made of salvaged lumber, the top being flush with the ground. Flies were a tremendous nuisance, as well as a health hazard. The Japanese would often let the flies out of the traps as they believed that flies were of benefit to the sugar cane crop, the main crop of the island. Garbage and trash were collected with old dilapidated Japanese trucks, loaded on garbage scows, and dumped into the sea. Following the battle, the Army sprayed the entire island with DDT solution by air. The only mosquito-borne disease recognized was dengue fever. The first sanitary report sent to the U. S. Navy by Doctor Wilson was forwarded by the Island Commander, Major General Sanderford Jarman, with the comment: "I have never seen so much done with so little."

Following his tour of duty on Saipan, Doctor Wilson was returned to Pearl Harbor and temporarily attached to the office of the Fleet Surgeon. In this capacity Doctor Wilson helped prepare the logistics for the Military Government for two subsequent invasions, Iwo Jima and Okinawa. Shortly before the invasion of Okinawa, he was ordered back to the States to teach in the Naval School of Military Government at Princeton University. He was on the teaching staff until the school

closed, at which time he was returned to the U. S. Public Health Service with a letter of commendation.

After serving as a medical officer with the Coast Guard for approximately one year, Dr. Thomas S. Hershey was ordered to the Naval School of Military Government at Columbia University in January 1944. In April of that year he was sent to Pearl Harbor where he joined the Military Government Section of the Fifth Amphibious Corps of the United States Marine Corps, then staging for the Marianas Islands invasion. They departed from Hawaii in May and landed on Saipan about 15 days after D-day. Since this group was intended for duty on Tinian, their duties on Saipan were only temporary and had mostly to do with the preparations for the Tinian invasion. They landed on Tinian on "D day+1" and immediately set up camp for the internment of the Island's civilian population which numbered about 22,000. A great many of these people needed medical and surgical attention. This care was provided. Later, when the bulk of the immediate post invasion casualties had been handled, a Navy G-6 unit was available for the civilian needs. Doctor Hershey remained on Tinian with the Military Government Section until May 1945, when he was returned to the Naval Civil Affairs Staging Area in California to prepare for a planned invasion of the China Coast. Because of the Japanese surrender, this invasion was not undertaken. Doctor Hershey was returned to the Public Health Service in 1945 and, at his request, was relieved from active duty early in 1946.

Drs. Harald M. Graning, Mayo L. Emory, Benno K. Milmore, and Evert A. Swensson were assigned to duty with the Navy in 1944 for training preparatory to serving with the Naval Civil Affairs and Military Government units that were being trained for the various invasions in the Pacific and Orient. These officers spent three months at the School of Military Government at Princeton University where special courses were conducted. From there they went to Columbia University for two months. They were then transferred to the Pacific Coast and, after staging periods of two or three months, Doctors Emory, Milmore, and Swensson were sent to the Southwest Pacific.

During his preparatory training at Columbia University, Doctor Emory had noted in "A Handbook on China, 1943" a formula for pre-

paring a milk substitute for use in the tropics. He kept this formula and while a health officer in northern Okinawa, he put it into use. There was an urgent need for food that could be easily prepared and easily distributed, which did not require any special equipment or trained personnel, which could be prepared from existing supplies and was acceptable to native tastes. Soybean was one of the foods available. It was found that a substance closely resembling milk was produced as an intermediate step in the preparation of a native soybean dish, tofu.

During July of 1945 Doctor Emory made up this formula experimentally in a native kitchen in a hospital in his area and tried it out on the pediatrics ward. The following day the formula was also used in an orphanage for 142 children. The food was readily accepted by the children. One cupful, approximately 200 cc, was given each child before the noon meal. Those who wished more received it. These children ranged from less than one year to 12 years of age. It was found that egg powder could be added easily to the soybean formula to make a more valuable food.

The method of preparation was simple. No special equipment or personnel was required to make the soybean milk-substitute. The equipment used was a suitable native container for soaking the beans, two native grinding stones about 10 inches in diameter, cheesecloth bags for straining the preparation, and suitable containers (tin cans) for dispensing the milk. Four natives (one cook and three helpers) could prepare enough milk-substitute to feed 1,000 children. Established native kitchens made large quantities of the milk-substitute without interfering with their existing duties.

A by-product of the soybean milk-substitute was the bean residue. It had a food value of 60 calories per 100 grams. It was eaten as a food, generally in soups, by both adults and children but was not suitable for infants.

Dried beans also are adequate sources of vitamins A and B but are lacking in C and G. Egg is also a good source of calcium and the vitamins A, B, and G. Vitamin C is lacking. No means were found for supplying vitamin C for the small children. However, adults and children over a year or a year and a half ate green potato leaves after they were cooked which proved to be an adequate source of vitamin C.

Dr. Evert A. Swensson served as Assistant Public Health Officer on a combined Army and Navy Military Government D team which had jurisdiction over the northern half of Okinawa and eventually the entire area. When he arrived, the military action was growing in impetus, particularly in the southern half of Okinawa. His chief activities were evacuating thousands of wounded civilians from the battle area by land and water to naval hospitals that had been established in the north.

For the protection of the United States forces and the native population, it was necessary that immediate attention be given to urgent problems of sanitation then present in the native villages. House-to-house and village-to-village programs of strict sanitary measures were carried out. A uniform latrine system was established. Every house was individually sprayed with DDT. Areas were drained for mosquito control. Water supplies were checked and chlorinated, and mass immunization programs were instituted within the limits of available supplies.

Within three to four weeks mosquito and fly control was established, and no major epidemics were encountered except a moderately severe outbreak of Japanese B encephalitis later in the year. This was largely confined to the native population. During the ensuing months the work consisted principally of organizing hospitals and public health centers to be staffed and maintained by native physicians, nurses, and sanitary workers.

Dr. Benno K. Milmore was assigned to the Tenth Army for duty with Civil Affairs team D-1. This was to be one of six teams for administration of Military Government in Formosa. He sailed from San Francisco toward the latter part of March and arrived in Okinawa in May. Formosa had been by-passed by military operations.

The Army and Navy shared responsibility for the Military Government of Okinawa. Each of the six teams was composed of officers from both Army and Navy. Three of these teams also included Public Health Service officers. Only two teams were actually placed in operation.

Doctor Milmore was assigned to a hospital that provided medical care for civilians. There he was responsible for operations of the clinical laboratory, camp sanitation, treatment of water supplies, and other matters of sanitation. He also had general supervision of a hospital for

the treatment of persons afflicted with leprosy. A Japanese civilian physician remained in charge of that work.

The camp at which Doctor Milmore was on duty was twice leveled by typhoons. The common diseases encountered in the native population were tetanus, malaria, Japanese B encephalitis, bacillary dysentery, amoebic dysentery, intestinal parasites, tuberculosis, and leprosy.

These officers were returned to the Public Health Service in the latter part of 1945 or early in 1946.

Dr. Harald M. Graning completed the training at Princeton and Columbia Universities and was tranferred to the West Coast preparatory to participating in invasions in the Orient but, with the Japanese surrender, these invasions were not undertaken. Doctor Graning remained for a time at the Naval Hospital on Treasure Island at San Francisco and was returned to duty with the Public Health Service in 1945.

Awards and Decorations Presented to Officers of the U. S. Public Health Service During and Following World War II

United States Decorations

Distinguished Service Medal

Deputy Surgeon General Warren F. Draper (Army)
Surgeon General Thomas Parran (Army)
Assistant Surgeon General Howard F. Smith (Army)

Purple Heart

Surgeon Fred J. Black (Army)
Passed Assistant Surgeon John J. Davies (Coast Guard)
Assistant Surgeon (R) Leon Glassman (Coast Guard)
Surgeon Floyd A. Hawk (Purple Heart Accolade) (Army)
Passed Assistant Surgeon Harry M. Levin (Coast Guard)
Assistant Surgeon Ralph R. Nix (Coast Guard)
Passed Assistant Surgeon Haskell B. Rosenblum (Coast Guard)

Legion of Merit

Senior Surgeon Joseph A. Bell (Army)
Senior Surgeon (R) Francisco J. Dy (Army)
Surgeon Edgar B. Johnwick (Army)

Senior Surgeon Victor H. Haas (Army)
Assistant Surgeon General Carl Michel (Coast Guard)
Medical Director William Henry Sebrell (Army)
Senior Surgeon Leonard A. Scheele (Army)
Assistant Surgeon General Howard F. Smith (Army)
Senior Surgeon Thomas H. Tomlinson, Jr. (Army)
Scientist Director Willard H. Wright (Army)

Bronze Star Medal

Surgeon Virgil J. Dorset (Army)
Surgeon William Hyatt Gordon (Coast Guard)
Surgeon James A. Grider, Jr. (Army)
Surgeon Robert L. Griffith (Coast Guard)
Surgeon John A. Lewis (Army)
Medical Director William W. Nesbit (Navy)
Senior Surgeon Harold R. Sandstead (Army)
Surgeon Albert N. Sarwold (Army)
Surgeon Paul E. Walker (Coast Guard)

Medal of Freedom

Senior Surgeon Joseph A. Bell (Army)
Surgeon Edgar B. Johnwick (Army)

Army Commendation Medal

Senior Surgeon George W. Bolin
Senior Sanitary Engineer Allen D. Brandt
Medical Director Edwin H. Carnes
Medical Director Gilbert L. Dunnahoo
Assistant Surgeon General R. Eugene Dyer
Senior Surgeon Robert H. Flinn
Surgeon (R) Daniel G. Gill
Sanitarian (R) William M. Hearon
Senior Surgeon Oswald F. Hedley
Senior Surgeon Noka B. Hon
Senior Sanitary Engineer Omar C. Hopkins
Scientist Leon Jacobs
Medical Director Knox E. Miller
Engineer (R) Philip S. Miller
Sanitary Engineer Arthur H. Neill
Surgeon Michael B. Shimkin
Sanitary Engineer (R) Porter A. Stephens

Surgeon Luther L. Terry
Senior Assistant Sanitarian (R) George A. Thompson, Jr.
Assistant Surgeon General Lewis R. Thompson
Dental Surgeon George E. Waterman
Sanitarian (R) Jesse B. Yaukey

Soldier's Medal
Junior Assistant Nurse Officer (R) Arlene M. Waldhaus (Army)

Navy and Marine Corps Medal
Assistant Surgeon Ralph R. Nix

Air Medal Coast Guard
Passed Assistant Surgeon William S. Baum

American Typhus Commission Medal
Surgeon (R) Robert L. Cherry
Assistant Surgeon General R. Eugene Dyer
Senior Surgeon Alexander G. Gilliam
Sanitarian (R) William L. Jellison
Senior Surgeon Leonard A. Scheele
Surgeon Norman H. Topping

Selective Service Medal
Surgeon Lewis H. Hoyle
Surgeon Louis Jacobs
Senior Assistant Surgeon Leslie W. Knott
Surgeon (R) Fritz Levy
Medical Director J. Davis Reichard
Senior Assistant Surgeon R. Frank Reider
Senior Assistant Surgeon Leonard M. Schuman
Surgeon (R) Eugene de Savitsch
Surgeon (R) Royal W. Williams

Navy Unit Commendation
Passed Assistant Dental Surgeon Jackson W. Bates
Surgeon Alexander A. Doerner
Passed Assistant Surgeon William H. Errgong, Jr.
Surgeon William Hyatt Gordon
Passed Assistant Surgeon Paul A. Kaufman
Dental Surgeon William P. Kroschel
Dental Surgeon Ralph S. Lloyd
Dental Surgeon (R) Arthur G. Malucky
Surgeon George K. Massengill

Medical Director Walter G. Nelson
Assistant Surgeon Ralph R. Nix
Passed Assistant Surgeon Benjamin H. Wolfman

Merchant Marine Victory Medal, U. S. Maritime Service
Assistant Surgeon General Justin K. Fuller

Foreign Decorations

Awards have been tendered by the various Governments listed below.

Forces Expeditionaire de Brazil
Passed Assistant Dental Surgeon (R) Julian W. Habercam
Passed Assistant Surgeon William B. Hoover
Passed Assistant Dental Surgeon William R. Tench

Philippine Presidential Citation
Assistant Surgeon General Howard F. Smith

Philippine Distinguished Service Star
Senior Surgeon (R) Francisco J. Dy
Assistant Surgeon General Howard F. Smith

British Order of Companion of the Bath
Deputy Surgeon General Warren F. Draper

French Legion of Honor
Deputy Surgeon General Warren F. Draper

French Order of Public Health
Senior Surgeon George W. Bolin
Deputy Surgeon General Warren F. Draper
Surgeon General Thomas Parran
Senior Surgeon Leonard A. Scheele

French Croixe de Guerre
Deputy Surgeon General Warren F. Draper (with palm)
Senior Surgeon Leonard A. Scheele

Netherlands Order of Orange-Nassau
Deputy Surgeon General Warren F. Draper

Colombia Knight of the Order of Boyaca
Surgeon (R) Eugene de Savitsch

The Commenda Nell'ordine Dei SS Maurizio e Lazzaro of Italy
Senior Surgeon Leonard A. Scheele

Belgium Order of Leopold II
Deputy Surgeon General Warren F. Draper
Surgeon (R) Eugene de Savitsch

Order Carlos Finlay of Cuba
Assistant Surgeon General R. Eugene Dyer
Medical Director Gilbert L. Dunnahoo
Surgeon General Thomas Parran
Senior Surgeon Leonard A. Scheele

Doctor Eduardo Liceaga Medal of Mexico
Surgeon General Thomas Parran

Orden al Merito of Chile
Surgeon General Thomas Parran

French Indochina Cross of Officer of the Order of a Million Elephants
Assistant Surgeon General Howard F. Smith

Finland Order of the White Rose
Medical Director Vance B. Murray (Knight, first class)
Medical Director Herbert A. Spencer (Commander)

Gold Cross of the Royal Order of the Phoenix of Greece
Medical Director Oswald F. Hedley (Commander)
Senior Sanitary Engineer Vernon G. MacKenzie

Silver Medal of the Hellenic Red Cross of Greece
Senior Surgeon Leslie M. Knott
Medical Director Oswald F. Hedley

Gold Cross Order of George I of Greece
Senior Surgeon Leslie W. Knott

Polish Polonia Restituta
*Senior Surgeon Henry A. Holle

Humane Order of African Redemption of Liberia
Medical Director Hildrus A. Poindexter (Knight Commander)
Senior Surgeon (R) John B. West (Knight Commander)
Nurse Officer (R) Mary L. Mills (Knight Officer)

Military Benefits to Service Officers

The Act of November 11, 1943, authorized military benefits for commissioned officers of the Service. The benefits were specified as "full" or "limited" and were defined. Service officers thus became entitled to:

(a) limited military benefits with respect to all active service in the Public Health Service in time of war, and

(b) full military benefits with respect to:
  (1) active service performed while detailed for duty with the armed forces,
  (2) active service outside the continental limits of the United States or in Alaska in time of war, and
  (3) active service performed while the Public Health Service is a part of the military forces pursuant to executive order of the President.

The consolidation and revision of the laws affecting the Service by the Public Health Service Act approved July 1, 1944, reenacted these military benefits. This Act, like the 1943 Act which it repealed, stated that in time of war the President may by Executive Order declare the commissioned corps of the Service to be a military service. However, it was not until June 1945 that an Executive Order was issued pursuant to this authority.

The Order reads:

EXECUTIVE ORDER NO. 9575

DECLARING THE COMMISSIONED CORPS OF THE PUBLIC HEALTH SERVICE TO BE A MILITARY SERVICE AND PRESCRIBING REGULATIONS THEREFOR

By virtue of the authority vested in me by section 216 of the Public Health Service Act, approved July 1, 1944, 58 Stat. 691: Title I of the First War Powers Act, approved December 1, 1941, 55 Stat. 838; and as President of the United States and Commander in Chief, I hereby declare the commissioned corps of the Public Health Service to be a military service and a branch of the land and naval forces of the United States during the period of the present war. The commissioned corps of the Public Health Service during such period shall be subject to the Articles for the Government of the Navy to the extent prescribed in the following regulations:

1. The Articles for the Government of the Navy are hereby adapted to apply to officers of the commissioned corps of the Public Health Service in the same manner

and to the same extent as they apply to commissioned officers of the Navy under like circumstances.

2. Any member of the commissioned corps of the Public Health Service who violates any provision of the Articles for the Government of the Navy shall be subject to trial and punishment as prescribed therein. The authority conferred by the Articles for the Government of the Navy upon the Secretary of the Navy with respect to the convening of general courts-martial and courts-martial and courts of inquiry, the review of their proceedings and the confirmation, remission, mitigation, and execution of sentences of general courts-martial shall be vested in the Federal Security Administrator, and the authority conferred by law for such purposes upon the commander-in-chief of a fleet or squadron and other officers of the Navy shall be vested in the Surgeon General of the Public Health Service. The authority to convene a general court-martial or court of inquiry may not be delegated to any other officer of the Public Health Service.

3. The general courts-martial and courts of inquiry convened pursuant to this authority shall have the same powers and authority as other general courts-martial and courts of inquiry under the Articles for the Government of the Navy. The provision of Article 7 thereof shall apply in carrying out sentences of imprisonment and hard labor.

4. Commissioned officers of the Public Health Service now or hereafter detailed for duty with the Army, Navy, or Coast Guard shall be subject to the laws for the government of the service to which detailed as now prescribed by law. In the initiation, prosecution, and completion of disciplinary action, including remission or mitigation of punishments for any offense which has been or may be committed by any commissioned officer of the Public Health Service while detailed for duty with the Army, Navy, or Coast Guard, the jurisdiction shall depend upon and be in accordance with the laws and regulations applicable to the Army, Navy, Coast Guard, or Public Health Service, as the case may be, whichever has jurisdiction of the person of the offender at the various stages of such action: *Provided,* That any punishment imposed and executed in accordance with the provisions of this paragraph shall not exceed that to which the offender was liable at the time of the commission of the offense.

5. Naval Courts and Boards, 1937 and modifications of revisions thereof, shall govern the conduct of general courts-martial and courts of inquiry in the Public Health Service.

6. This order shall be published in the Federal Register and shall be effective on and after the thirtieth day following the date of such publication.

HARRY S. TRUMAN

THE WHITE HOUSE
June 21, 1945

Medical Division of the Office of Civilian Defense

An Executive Order signed by President Franklin D. Roosevelt on May 20, 1941, established the Office of Civilian Defense and appointed the Honorable Fiorello H. LaGuardia, Mayor of the City of New York, as Director of Civilian Defense. Mr. LaGuardia requested Dr. George Baehr of New York City to accept appointment as Chief Medical Officer for the purpose of organizing and directing the Medical Division of the Office of Civilian Defense.

Doctor Baehr advised Mr. LaGuardia that the medical portion of civilian defense could not be organized without any relation to the U. S. Public Health Service and requested permission to confer with Surgeon General Thomas Parran before accepting the appointment. Doctor Parran concurred in this point of view and offered the full cooperation and assistance of the Public Health Service. He proposed: (1) that Doctor Baehr be commissioned a medical director in the Public Health Service reserve for detail to the Office of Civilian Defense; (2) that the Public Health Service assign a regular officer who was experienced in public health administration and was familiar with Public Health Service resources, to assist Doctor Baehr. Mr. LaGuardia laid these proposals before President Roosevelt, who approved the arrangement. Doctor Baehr accordingly resigned his reserve commission in the Army and was appointed in the Public Health Service in June 1941, reporting for duty at the Office of Civilian Defense on June 25, 1941.

Before becoming Chief Medical Officer, Doctor Baehr had served for some years as Clinical Professor of Medicine at Columbia University, Chief of the First Medical Service at the Mount Sinai Hospital in New York, and as a Trustee of the New York Academy of Medicine. He was also a member of the Public Health Council of the State of New York.

In the summer and fall of 1941, few Americans appreciated the basic general principles of civilian defense—the comparative protection of indoor shelter, the danger of moving through the streets during an attack, the relative safety in dispersal of people in small groups, and the essential requirement for orderly movement of the minimum number of protection personnel at the time of a raid and then only on direct orders

(From USPHS Records)

Conference of Regional Engineers of the Office of Civilian Defense, Cleveland, Ohio, May 1943. (All Service officers except Major General U. S. Grant III)

FIRST ROW (Left to right): John H. Brewster, New York; Dr. Eugene Scott, Chief Gas Defense Officer, OCD, Washington; Ralph E. Tarbett, Chief, Facility Security Program, PHS, Washington; Major General U. S. Grant III, U. S. Army, Chief, Protection Branch, OCD, Washington; John K. Hoskins, Chief, Sanitation Section, PHS, Washington; Dr. W. Palmer Dearing, Assistant Chief Medical Officer, OCD, Washington; Gordon E. McCallum, Chief Sanitary Engineer, OCD, Washington. SECOND ROW: Daniel W. Evans, Atlanta, William H. Cary, Chicago; Hugh R. McCall, Baltimore; William T. Ingram, San Francisco; Gerald E. Arnold, San Francisco; Carl E. Schwob, Dallas; Howard Potter, Boston; A. J. Alter, Washington; Frank Woodbury Jones, Cleveland.

from central control. Most physicians and other local civil defense leaders did not understand that the darkness, dirt, and confusion of an air raid preclude almost all surgery at the incidents and in the street, and that even first aid is difficult or most rudimentary under these circumstances.

In spite of the increased burdens which mobilization was placing on hospitals, it was thought best to base the plans for the Emergency Medical Service upon the hospitals of the country. In view of the distances that separated the United States from its enemies, only sporadic air raids with demolition or gas bombs seemed at all likely, with long free intervals, except for sabotage of industrial plants and public utilities. This was all that could be anticipated, certainly as long as the British Isles held out. If enemy air raids were attempted on any cities of the United States, they would occur suddenly and perhaps without warning. Under these circumstances of indefinite watchful waiting, it was impossible to keep an elaborate civilian organization constantly and efficiently on the alert as in Great Britain.

Undoubtedly, the greatest handicap encountered in most of the States in the summer of 1941 was the absence of a specially constituted Emergency Medical Service and full-time civil defense leadership on the State level. Acting upon suggestions received from Washington before creation of a United States Office of Civilian Defense, State Councils of Defense had been organized into several committees, one of which dealt with a heterogeneous agglomeration of functions, health, welfare, recreation, nutrition, consumer interests, and related activities. It became necessary for the staff of the Chief Medical Officer of the Office of Civilian Defense to canvass every important State in order to interpret the Emergency Medical Service program and to persuade the State Council to establish a State Emergency Medical Service.

These objectives were rapidly accomplished in almost every State in the Union. In about one-half the States, the State Health Officer was designated as Chief of the Emergency Medical Service, and a deputy or other member of the staff of the health department was assigned either to full-time or half-time duty as Deputy Chief. In most of the remaining States special funds were made available and a full-time Chief of Emergency Medical Service was appointed. Later, in order to avoid the necessity for sending Federal officers into the States to supervise

specific Federal responsibilities, the State Chief of Emergency Medical Service or the Deputy State Chief in most of the coastal States, upon the recommendation of the Office of Civilian Defense, was commissioned in the Reserve Corps of the Public Health Service so that he might combine the functions of a Federal and State officer under the guidance of a Regional Medical Officer.

Soon after its establishment, the Office of Civilian Defense divided the country into nine Regions, coterminous with the Army Service Command areas. Steps were immediately taken by the Office of Civilian Defense and the Public Health Service to secure competent physicians to serve as Regional Medical Officers. It was necessary to recruit most of the Regional Medical Officers into the Reserve from outside the Service, but as the organization developed, some Regular officers were assigned to these important posts. Sanitary Engineer Director Ralph E. Tarbett was assigned to head the sanitary engineering activities with Passed Assistant Sanitary Engineer (R) Gordon E. McCallum as his assistant. They recruited regional engineers for appointment in the Reserve and assignment to the Office of Civilian Defense. The staff was gradually enlarged by the assignment of Nurse Deputies, Gas Officers, Rescus Officers, and Administrative Assistants.

Miss Marian Randall, of the Henry Street Visiting Nurse Service and the Milbank Memorial Fund in New York, was recruited as part-time nursing consultant to the Office of Civilian Defense in October 1941, and became full-time Chief Nurse in February 1942. Nurse Officer Zella Bryant of the Farm Security Administration became her assistant and later entered the Public Health Service.

In spite of international conventions banning the use of poisonous gases, the Italians had recently used gas in Ethiopia and the Japanese were reported to have used it against the Chinese; thus the organization of a gas protection program received a great deal of emphasis. About the time of the Battle of Midway in 1942, the Pacific Coast was considered in danger of attack and rather urgent attention was paid to the development of civilian defenses in that region. Within a short time 300,000 gas masks and 10,000 suits of protective clothing were distributed to civil defense authorities on the Pacific Coast.

The officers who served at various times as Regional Medical Officers and as Regional Sanitary Engineer Officers were as follows:

First Civilian Defense Region, Boston, Massachusetts
Senior Surgeon (R) Dudley A. Reekie
Senior Surgeon (R) A. William Reggio
Sanitary Engineer (R) Howard H. Potter

Second Civilian Defense Region, New York, New York
Senior Surgeon (R) H. van Zile Hyde
Senior Surgeon (R) John J. Bourke
Sanitary Engineer (R) John H. Brewster

Third Civilian Defense Region, Baltimore, Maryland
Senior Surgeon (R) W. Ross Cameron
Senior Surgeon Mark V. Ziegler
Surgeon (R) Arthur J. Lomas
Sanitary Engineer (R) Hugh R. McCall
Sanitary Engineer (R) Warren H. Booker

Fourth Civilian Defense Region, Atlanta, Georgia
Senior Surgeon (R) Judson D. Dowling
Senior Surgeon (R) Burt A. Dyar
Surgeon (R) Harrison A. Walker
Sanitary Engineer (R) Daniel W. Evans

Fifth Civilian Defense Region, Cleveland, Ohio
Senior Surgeon (R) William S. Keller
Sanitary Engineer (R) Waldo W. Towne
Sanitary Engineer (R) Frank W. Jones

Sixth Civilian Defense Region, Chicago, Illinois
Senior Surgeon (R) William S. Keller
Senior Surgeon (R) Lloyd V. Gaston
Sanitary Engineer (R) William H. Cary

Seventh Civilian Defense Region, Omaha, Nebraska
Senior Surgeon (R) Wallace D. Hunt
Passed Assistant Sanitary Engineer (R) Henry L. Roahrig
Sanitary Engineer (R) Lindon J. Murphy

Eighth Civilian Defense Region, Dallas, Texas
Senior Surgeon (R) Ozro T. Woods
Senior Surgeon (R) Witten B. Russ
Sanitary Engineer (R) Carl E. Schwob

Ninth Civilian Defense Region, San Francisco, California
Senior Surgeon (R) Wallace D. Hunt
Surgeon Leonard A. Scheele (Acting)
Senior Surgeon Fred T. Foard
Senior Surgeon (R) Ludwig A. Emge
Senior Surgeon (R) Courtney M. Smith
Senior Surgeon (R) Charles E. Sheppard
Sanitary Engineer (R) Gerald E. Arnold
Passed Assistant Sanitary Engineer (R) William T. Ingram
Passed Assistant Sanitary Engineer (R) John W. Luthin

The commissioning in the inactive Reserve of the Public Health Service of the State Chiefs of Emergency Medical Service still further facilitated the welding together of the States by Regions, so that they all came to feel themselves a part of a team. This spirit was encouraged by having the Regional Medical Officers work closely with the State Chiefs, giving them all possible assistance without any sense of dictation. It was made the duty of the Regional Medical Officers to ascertain the opinions and problems of the State Chiefs and to report them monthly to the Chief Medical Officer. Changes in policy could then be formulated by the Medical Division with full knowledge of the reaction to be anticipated in the field, and the Regional Medical Officers could prepare in advance for the release of such instructions so as to assure a cordial reception. Dr. W. Palmer Dearing served as Assistant Chief Medical Officer from soon after the establishment of the Medical Division of the Office of Civilian Defense. Personnel of the Service attached to the headquarters staff of the Office of Civilian Defense at one time or another included the following:

Medical Director (R) George Baehr, Chief Medical Officer
Senior Surgeon W. Palmer Dearing, Assistant Chief Medical Officer
Senior Sanitary Engineer Ralph E. Tarbett, Chief Sanitary Engineer
Surgeon Leonard A. Scheele, Field Casualty Section
Surgeon Victor H. Vogel, Administrative Director, Blood and Plasma Section; Emergency Casualty Reporting and Mortuary Services; Ambulance Design and Procurement Section
Surgeon Ward L. Mould, Procurement Officer; Medical Gas Officer; Industrial Plant Protection Section
Surgeon (R) John B. Alsever, Technical Director, Blood and Plasma Section

Surgeon Karl J. Thomson, Technical Intelligence
Surgeon (R) Granville A. Bennett, Gas Protection Training
Surgeon (R) Hamilton Southworth, Overseas Intelligence
Surgeon (R) Dean A. Clark, Liaison Officer, Emergency Medical Section
Surgeon Thomas B. McKneely, Assistant Liaison Officer
Sanitary Engineer (R) Gordon E. McCallum, Assistant Chief Sanitary Engineer
Sanitary Engineer (R) Philip S. Miller, Rescue Officer
Assistant Sanitary Engineer (R) Amos J. Alter, Sanitary Engineering Activities
Assistant Sanitary Engineer (R) Charles I. Mansur, Sanitary Engineering Activities
Passed Assistant Surgeon (R) Jack Masur, Hospital Section
Senior Surgeon (R) H. van Zile Hyde, Field Casualty Section
Passed Assistant Surgeon (R) Harold L. Marks, Procurement Officer
Senior Surgeon (R) Emeric I. Dobos, Gas Protection Training
Surgeon (R) Charles C. Chapple, Gas Protection Training
Sanitarian (R) Eugene W. Scott, Gas Protection Training
Passed Assistant Sanitarian (R) William M. Hearon, Gas Protection Training
Senior Engineer (R) Simon H. Ash, Rescue Officer
Passed Assistant Sanitarian (R) Alberto F. Thompson, Gas Protection Training
Surgeon (R) Benjamin F. Miller, Technical Intelligence
Surgeon (R) Abraham N. Franzblau, Gas Protection
Senior Assistant Nurse Officer (R) Zella Bryant, Assistant Chief Nurse

LIQUIDATION PERIOD

Senior Surgeon (R) John J. Bourke, Chief Medical Officer in Liquidation Period
Surgeon (R) Maxwell Chapman, Chief Medical Officer in Liquidation Period
Senior Surgeon (R) Courtney M. Smith, Chief Medical Officer in Liquidation Period

A staff of technical experts was assembled, Regional Medical and Sanitary Engineering Offices were established, and an Emergency Medical Service was organized in every State and in most of the important communities throughout the country. An organization for protection against war gases was set up in the coastal States and in the major industrial centers in the interior, many thousands were trained in the techniques of rescue and gas protection work, and a program of protection and mutual aid for water supply systems and sanitation facilities was established in all States.

Other accomplishments of the Medical Division included the establishment of a nationwide system of Casualty Receiving Hospitals, 321

potential Emergency Base Hospitals in 20 coastal States, 180 hospital blood and plasma banks, reserve depots of dried and frozen plasma in 400 cities, more than 120 affiliated hospital units, each consisting of 15 physicians, surgeons, and specialists commissioned in the Reserve Corps of the U. S. Public Health Service, and 80 emergency nursing units, each comprised of 22 nurses. At the instigation of the Medical Division and with its assistance, 150,000 Volunteer Nurses' Aides were trained under the Red Cross for wartime volunteer service in hospitals.

One of the urgent problems of the Medical Division was the organization of an ambulance service sufficient to transport numbers of civilian casualties. A four-stretcher ambulance body, made of non-critical materials, was finally designed for mounting on cut-down chassis of small passenger automobiles. Six hundred of these were built and distributed to the most probable target communities.

Dr. Dean A. Clark, assisted by and later succeeded by Dr. Thomas B. McKneely, with the aid of Miss Frances Cutter from the Public Health Service, in close cooperation with the Office of Civilian Defense, organized and administered the Emergency Medical Section of the Public Health Service in developing the affiliated hospital units throughout the country. They also arranged for the provision of medical service to civilian casualties under the Civilian War Security Program, an emergency program financed from the President's Emergency Fund. The Emergency Medical Section also provided medical consultation to the Bureau of Old Age and Survivors' Insurance, Social Security Board, in the administration of cash payments to civilians incurring disability related to enemy action or certain civilian defense activities.

A total of 63 commissioned officers of the Service were assigned to the Medical Division of the Office of Civilian Defense.

On March 1, 1944, Dr. George Baehr, after about three years of service as Chief Medical Officer, requested that he be placed on inactive duty. He was succeeded as Chief Medical Officer by Dr. W. Palmer Dearing. Drs. Courtney M. Smith, Maxwell Chapman, and John J. Bourke served for short times as Chief Medical Officer during the demobilization period.

The Regional Offices of the Office of Civilian Defense were abolished in 1944. The work of the Medical Division was concluded in 1945.

Alaska Military Highway Project

The Administrator of the Federal Works Agency in April 1942 requested the assistance of Surgeon General Parran in the operation of hospitals and clinics on the Alaska Highway project of the Public Roads Administration. Doctor Parran agreed to assume responsibility for medical care of civilians engaged in construction of the Alaska Highway and for the supervision of the various features of sanitation on the project. Under the terms of the agreement, the Public Health Service undertook to furnish the necessary medical, dental, and sanitary engineer officers and administrative personnel; the Commissioner of the Public Roads Administration undertook to recruit all additional personnel on recommendation of the Public Health Service officer in charge, to build and equip hospitals, provide ambulances, furnish transportation, and meet such other nonprofessional needs as might arise.

Dr. Edwin H. Carnes was assigned as director of the medical and sanitary program, Robert W. Kehr as chief sanitation officer, and Dr. Marion B. Noyes as assistant medical officer. Doctor Carnes was instructed to report by June 1 to the district engineer of the Public Roads Administration in charge of the project in Seattle, Washington.

The task that confronted this small vanguard was to set up facilities that would provide medical care for thousands of men scattered over 1,600 miles of wilderness in over 100 widely separated camps, to supervise sanitation, recruit additional personnel, obtain equipment, and establish sources and means of supply.

Before plans could be made for organization, hospital construction, sanitary installations, and procurement of personnel, it was necessary to survey the area and obtain detailed information concerning the plans of the Public Roads Administration in regard to distribution and number of personnel and location of camps. Shortly after arriving in Seattle, Doctor Carnes and Mr. Kehr arranged for airplane transportation from Seattle to Fairbanks, with stops at all airports along the route of the proposed highway.

Following the survey trip, a tentative plan of organization was drawn up. To provide medical facilities on the highway, a base hospital was planned for each of the two sectors, one to be located at Fort Nelson,

British Columbia, the other at Whitehorse. To supplement these base hospitals, it was arranged to contract for beds in small civilian hospitals already in operation at Dawson Creek, Fort St. John, Whitehorse, and Fairbanks and to install dispensaries at 200-mile intervals between these points so that no camp would be over 100 miles from medical facilities.

Each camp had a first-aid station, with a competent first-aid attendant on duty at all times and equipped with necessary first-aid supplies. An ambulance was available for each camp of over 100 men.

The plans for the base hospitals provided a capacity of 50 beds each, with potential expansion to 100 beds or more by the addition of ward sections. The main portion of the building was planned to house the administrative and clinical facilities, with wings added for wards, kitchen, and mess hall. All buildings were of one story; the walls and floors were lined and insulated to withstand outside temperatures from 40° to 60° below zero. Heating, except for the operating suite, was furnished by oil-burning stoves located at strategic points throughout the building.

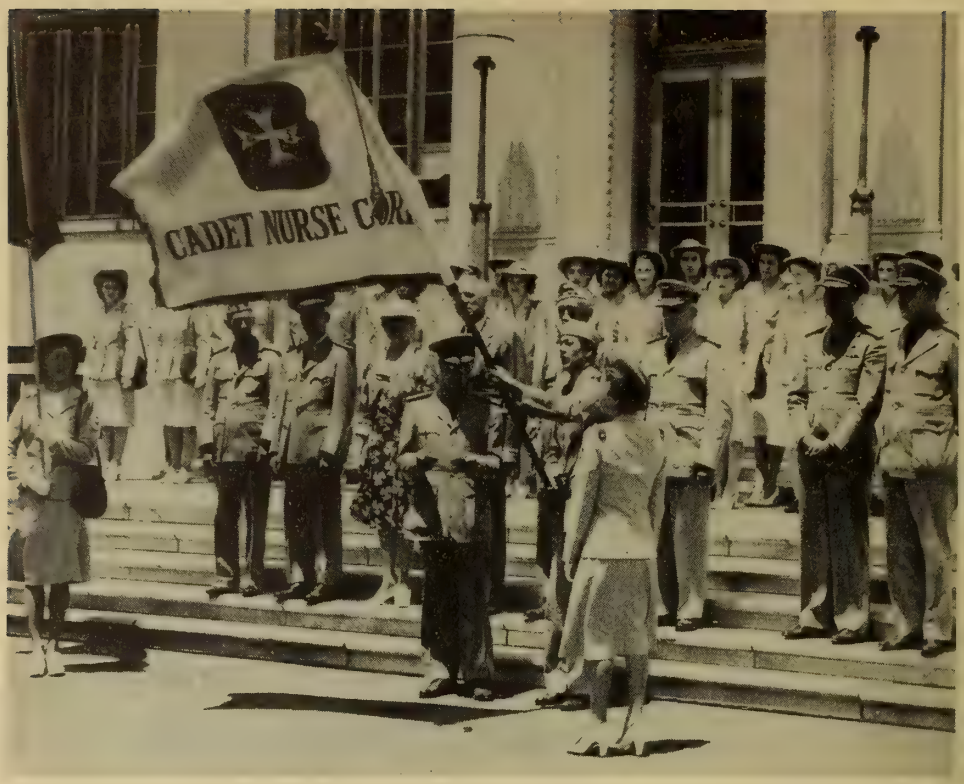
Headquarters for Doctor Carnes and Mr. Kehr were at Whitehorse because of its central location. Doctor Carnes also maintained an office at Edmonton, Alberta, for liaison with the district office of the Public Roads Administration and the officer in charge of the medical work of the United States Army Corps of Engineers. The professional staff for this project consisted of 13 medical officers, three dental officers, four sanitary engineers, 23 nurses, and two administrative assistants.

For the most part, the types of cases treated were those normally encountered in the United States. The majority were general medical cases of a routine nature; next in volume were surgical cases, which included elective surgical operations as well as emergencies. Dental care was provided in the larger installations. The injuries, in traumatic cases, were either of a moderate severity or so extensive as to cause immediate death. Mortality from injuries, however, was quite low, being only 0.037 per 1,000.

A sanitary engineer was stationed in each of three sections of the highway. These officers made periodic inspections of all camps, reporting any deviation from established standards of sanitation and submitting definite recommendations for the correction of defects found. In the initial stages of camp construction, the sanitary engineers gave

(From USPHS Records)

Cadet nurses, Adelphi College, Garden City, New York.



(From USPHS Records)

Presentation of Cadet Nurse Corps flag to Nurse Director Lucile Petry by Surgeon General Thomas Parran (reading), at ceremonies, Washington, D. C., June 1944, attended by officers of the Army, Navy, and Public Health Service. Representative Francis P. Bolton of Ohio (4th left front), was among the Congressional sponsors of the Nurse Training Act.

technical advice with reference to water supply and sewage disposal and, when necessary, furnished plans and designs for water supply and sewerage systems.

Repeated trips by plane, under all sorts of weather conditions, were necessary to select sites for erection of the various facilities, to determine the need for additional installations, to equip, staff, and activate them, and to make periodic inspections. It was on one of these trips that Mr. Kehr lost his life in 1942; the airplane in which he was flying crashed, with the loss of all on board. The Kehr General Hospital located at Fort Nelson, British Columbia, was named in honor of Passed Assistant Sanitary Engineer Robert W. Kehr and affords shelter to travelers on the highway to Alaska.

The medical and sanitary engineer officers of the Public Health Service were concerned primarily with the care of those civilians engaged in highway construction under the Public Roads Administration; the officers of the Army Medical Corps provided medical care for those civilians engaged in the construction of various projects such as pipe-line and refinery construction, telephone lines, and various other developmental activities under the United States Army Corps of Engineers.

To coordinate the two services, both of which rendered medical care to civilian workers, the commissioned officers of the Public Health Service, by request of the Secretary of War, were assigned to the United States Army Corps of Engineers on March 23, 1943.

Completion of the Alaska Military Highway late in 1943 brought the project to a close. Officers of the Service were transferred to duty in the United States in late November and early December. Dr. Edwin H. Carnes departed December 4, 1943, after transfer of all facilities and equipment to the Northwest Service Command of the U. S. Army.

Nursing

The war period brought many additional responsibilities to Public Health Service nurses. In 1940 the National Nursing Council for Defense (later the National Nursing Council for War Service) requested the Public Health Service to make a survey of all registered nurses in the United States. The Public Health Nursing Section headed by Miss

Pearl McIver (later assisted by Miss Mary Dunn) administered the survey. Detailed information on nearly 300,000 nurses was secured, coded, placed on punch cards, and analyzed. These data provided a picture of nursing resources when the country mobilized for war. Realizing that many more nurses would be needed, a National Nursing Resources Committee took steps to secure Federal aid for schools of nursing. When an appropriation was made for this purpose in 1941, the Public Health Nursing Section of the Public Health Service was given the responsibility for developing a nursing education unit to administer the program. Mrs. Eugenia K. Spalding, Miss Lucile Petry, and Miss Margaret Arnstein came into the Service to carry forward this part of the work.

In 1941, two years prior to the establishment of the Cadet Nurse Corps, Congress appropriated $5,300,000 to attract young women to nursing and as an incentive to schools of nursing and hospitals to expand their classes and to provide additional personnel to operate the large schools. Student enrollment increased 15 percent.

Realizing that because of insufficient enrollment in schools of nursing this program could not possibly meet nursing needs, it became necessary to devise some plan whereby the Federal Government would furnish leadership for a large increase in the number of nurses trained. An Act of Congress approved June 15, 1943 (known as the Bolton Act, for Congresswoman Frances Bolton of Ohio who sponsored the bill in the House) established the Cadet Nurse Corps of the Public Health Service, effective July 1, 1943. This was designed to meet both military and essential civilian nursing needs. Responsibility for administration of this program was placed in the Division of Nurse Education of the Public Health Service, and Miss Lucile Petry was chosen by Surgeon General Parran as chief of the newly established division.

Under the terms of this Act establishing the Cadet Nurse Corps, Federal scholarships in nurse education were made available to qualified young women upon enrollment in schools of nursing whose curricula and nursing facilities met standards prescribed by the Public Health Service. These scholarship grants-in-aid to schools covered maintenance costs for the first nine months, tuition and fees throughout the program, and monthly spending allowances. Cadet nurses were also provided

with hospital uniforms and with the distinctive gray and scarlet outdoor uniforms of the Cadet Nurse Corps.

A staff of nurse education consultants as well as other personnel concerned with recruitment, public relations, and administrative matters was established in the Division Headquarters in Washington and in the District Offices of the Service throughout the country to take charge of the educational, fiscal, recruitment, and other phases of this program. The principal duties of the nurse consultants and associated staff involved the review of applications for allotments, the preparation of budgets, interpretation of regulations issued by the Surgeon General of the Public Health Service, and assistance to schools of nursing in solving administrative and educational problems related to the Cadet Nurse Corps.

During the first two years of the program nurse consultants attended more than 300 regional and State conferences sponsored by the National Nursing Council for War Service, the War Manpower Commission, and the Public Health Service, and visited approximately 800 schools. The quota for the Cadet Corps set for the first two years was 125,000 new nurses, 65,000 to be recruited during the first 12-month period and 60,000 in the year ending June 30, 1945. During the first two years of this program appropriations by Congress totaled $118,200,000, and both quotas were exceeded. The goal for the fiscal year 1946 was reduced to 50,000 after V-E day; approximately three-quarters of these new students had been enrolled at the time of the Japanese surrender, when all Cadet Nurse Corps recruitment was canceled.

More than 1,000 schools of nursing were approved for participation during the first year of the program. This number increased to 1,100 in the second year, and by the third year the number was more than 1,125. The basic curriculum in all schools of nursing having units of the Corps was accelerated to 30 months with a senior nurse cadet special training period in those States and schools requiring a full 36-month course for graduation and registration. The purpose of this terminal period was to allow a wider distribution of student services and to provide broader nursing experience for senior students prior to graduation.

By the end of the second year of the Cadet Nurse Corps 30,442 senior nurse cadets had become available; 63 percent of these served in their home hospitals, and 27 percent in hospitals of the Army, Navy, Veterans'

Administration, Public Health Service, and Office of Indian Affairs. The remaining 10 percent spent their senior cadet periods in other civilian hospitals or public health agencies, a valuable contribution to the problem of distribution. Senior cadets displayed a sincere desire to serve where they were most needed and received enthusiastic commendation wherever they went.

The number of graduates produced by the Corps in the first year (1943) was 1,206 which represented student nurses who had transferred to the Corps in the second and third years of their nursing course. Graduates for the second year totaled 13,999 with an additional 21,523 scheduled for the year ending June 30, 1946. In February 1945, when recruitment for the Army and Navy Nurse Corps was at a peak, 60 percent of Cadet Nurse Corps graduates either were serving with the armed forces or had applied for military duty. A spot check later showed this figure would reach 80 percent. Active military recruitment ceased before these young women were appointed, but their record is a splendid commentary on their loyalty and patriotism. The expansion of school enrollments under the Cadet Nurse Corps program naturally brought up many problems; one of the most critical was the wartime shortage in teaching and supervisory personnel.

In addition to Federal scholarships for student nurses, the Act establishing the Cadet Nurse Corps also provided funds to graduate nurses for advanced study in order to increase the number of instructors and to prepare more nurses for such important specialized fields as public health and psychiatry. As of October 15, 1945, after which date no more enrollments were permitted, approximately 15,000 nurses had received Federal aid for advanced study.

Where it was impossible for graduate nurses to be spared from their positions to take postgraduate preparation, a series of on-the-job courses were brought to the hospital. This was not designed as a substitute for adequate postgraduate preparation but was undertaken as an emergency measure to aid nurses who were pressed into positions for which they were not fully prepared.

While the war time contribution of the Cadet Nurse Corps was tremendous—providing a great reservoir of nursepower for the military

and preventing the collapse of civilian nursing service on the home front—certain long-range benefits stand out in bold relief.

In accelerating programs, schools of nursing eliminated repetition and nonessentials in the basic curriculum. Schools also found that they were able to purchase a great deal of instruction, especially in the sciences from junior and senior colleges, and by planning cooperatively, they could take advantage of the vast instructional facilities available in their own and neighboring communities.

The senior cadet period proved that student nurses are qualified to accept high responsibility earlier than was previously thought possible. Some elements of the special extramural training before graduation merited retention. During the senior cadet period, through increased affiliations, nursing service was distributed to hospitals that did not have nursing schools, especially the Federal services. The educational program was improved by providing additional experience in a variety of nursing techniques.

Preparation of budgets for Federal funds by schools focused attention on financial problems and their solutions. This stimulated approved accounting procedures. Educational enrollment records also improved noticeably, so that a greater amount of vital and needed information became available. There are a number of practices arising from the stress of a national emergency, rather than from the initiation of the program, which should be discouraged. The 80 percent of service given by student nurses in hospitals with schools should be decreased in the interest of quality of patient care and of the educational program. The considerable amount of non-nursing service performed by students should be lessened appreciably. Inadequacies in school administration brought to light by the demands of war must be studied and the quality of individual staffs improved.

Probably one of the most beneficial effects of the Cadet Nurse Corps is that a larger public than ever before is informed on the needs and uses of nursing. National, State, and local organizations, both professional and nonprofessional, have cooperated in satisfying this common need. Civic groups and community leaders have become "nurse conscious," eager to devote time and effort and money to the development of first-rate nursepower in their localities. Hospital administrators and

members of medical and nursing professions have learned to work together more closely as natural allies in the cause of nursing education. Other gratifying results are that a greater number of superior candidates are attracted to a career in professional nursing and there is an increase in the number of college students entering nursing.

The program was officially concluded on June 30, 1948.

War Shipping Administration

World War II was a far-flung global war. Its successful prosecution depended upon the ability to move according to schedule over the seas, tremendous armies and huge masses of cargo to our armies, and those of our allies, furnishing them with munitions, food, and other needed supplies. The number of merchant ships in existence at the beginning of the war was entirely inadequate to meet this demand, as was the number of trained seamen to operate them.

To meet this situation, the Maritime Commission was charged with building new ships and the War Shipping Administration with operating and repairing ships. The Maritime Commission was created as an independent Government agency by the Merchant Marine Act of 1936 to assist in the development and maintenance of an adequate and well-balanced merchant marine to meet the needs of foreign and domestic commerce and national defense. The War Shipping Administration was created by an Executive Order on February 7, 1942, to insure a more effective utilization of the merchant fleet of the United States in the prosecution of the war. Certain functions of the Maritime Commission were transferred to this new agency, and additional responsibilities assigned to it. The War Shipping Administration owned or chartered and operated during the war about 80 percent of the seagoing merchant ships of the United States, the remaining vessels being owned or chartered by the Army or Navy. About 90 percent of all the military and essential cargo moved in American ships was carried in War Shipping Administration vessels, and the Administration's responsibility extended to all phases of shipping.

The saga of the wartime merchant marine is described in publications of the Maritime Commission and the War Shipping Administration,

as well as in books, and newspaper and magazine articles. Suffice it to say here that the effective labor force of the American merchant fleet rose from less than 50,000 to nearly 300,000 men. The recruitment, training, and medical care problems posed by this large, continuously growing, and ever changing labor force were numerous and complex. Vice Admiral Emory S. Land, Chairman of the Maritime Commission and Director of the War Shipping Administration, and his assistant, Captain Edward McCauley, a member of the Maritime Commission and Assistant Director of the War Shipping Administration, in charge of recruitment, manning, and welfare, and Rear Admiral Telfair Knight, Chief of the Maritime Service, which was the "Training Division," requested the Public Health Service to assume responsibility for developing and operating the Medical Division of the War Shipping Administration. Dr. Justin K. Fuller was detailed to the War Shipping Administration for this purpose, and served as Chief Medical Officer with the grade of Assistant Surgeon General.

MEDICAL DIVISION FUNCTIONS

The functions of the Medical Division were to provide supervision, regulation, and control of the medical and health activities of the War Shipping Administration. Peacetime medical facilities available to merchant seamen were totally inadequate to meet the wartime demand, and additional facilities had to be developed through augmentation and coordination of the medical activities of the War Shipping Administration, Public Health Service, Coast Guard, Navy, Army, medical departments of steamship operators, and other public and private agencies. These medical activities were everywhere closely integrated and correlated, but nowhere duplicated or in conflict. In addition, many entirely new facilities were developed.

As indicated above, there was at all times during the war, a shortage of manpower in the Merchant Marine. Obvious reasons for this shortage were the small size of the prewar maritime labor force; the losses in death and injury it suffered in the "Battle of the Atlantic," the "Murmansk Run," the "Mediterranean Life Line," and the "Caribbean Oil Line"; the manning demands made by new ships which were added to the fleet by steadily increasing scores, and later, hundreds; and the com-

petition for manpower which the merchant fleet had to meet in other fields of wartime endeavor, such as the armed forces and shoreside employment, some of which offered more in glamour and pay. These and other factors created a very difficult manning situation that was eased, but at no time solved, by the elaborate manpower program developed by the War Shipping Administration during the war. Three obvious motives impelled the course of this program; first, to train new men and upgrade old ones; second, to keep experienced men from deserting the maritime labor force; and third, to induce those who had left the industry to return. Such a program cannot be processed successfully without medical support, because a seaman, especially in wartime, cannot carry on his duties efficiently unless he is in a reasonably good mental and physical health.

The Medical Division was divided into four principal administrative sections. These four sections were concerned with the medical aspects of enrolling and training inexperienced applicants for employment in the maritime industry (Training Division); the medical aspects of the rehabilitation of certain disabled seamen to prepare them for return to sea (Recruitment and Manning Division); the medical examination of seamen prior to signing-on for voyage; and the provision of medical service aboard vessels while at sea (Division of Vessel Operations). In addition, there were five Special Professional Services which, working through the foregoing four sections, carried out integrated programs in the fields of communicable diseases, sanitary engineering, psychobiology, dentistry, and dietetics.

During September 1942, Dr. Daniel Blain, a practicing psychiatrist in New York City, was commissioned in the Reserve Corps of the Public Health Service and placed in immediate charge of the medical phases of the recruitment and manning activities. His administrative ability is evidenced by the success with which his program was developed and prosecuted. He was also Chief Medical Officer of the United Seamen's Service (USS), which was for merchant seamen what the United Service Organization (USO) was for the members of the armed forces.

The great bulk of wartime merchant seamen were employees of the War Shipping Administration, and most of the tremendous wartime merchant fleet was in the foreign trade. The peacetime provisions for

(U. S. Maritime Commission Photo)

Assistant Surgeon General Justin K. Fuller, Chief Medical Officer, War Shipping Administration, 1942-1949

the treatment of merchant seamen in foreign countries were entirely disrupted by the war; therefore, it became necessary to provide treatment for merchant seamen overseas at Military-Naval Hospitals of the United States or our Allies. This fact made necessary close coordination and cooperation by the Army, the Navy, the War Shipping Administration, and the Public Health Service.

With the cooperation of the Surgeons General of the Army, Navy, and Public Health Service, the medical facilities of the Army and Navy as well as those of our Allies, were opened to merchant seamen, and more than 50,000 seamen were admitted to Army hospitals overseas. Important medical coordination among the State Department, foreign agents of steamship operators, the Army, and the Navy was achieved through the efforts of the foreign representatives of the War Shipping Administration. Through cooperation with the government of the Panama Canal, medical dispensaries for merchant seamen were opened at the dockyards in Christobal and Balboa, greatly increasing the efficiency of medical service for the tremendous number of merchant ships going through the Canal.

PORT MEDICAL OFFICES

Port Medical Offices were established at all of the principal ports of the continental United States. These offices were conducted in cooperation with the United Seamen's Service. They developed an extensive medical and social service program for the families of merchant seamen, on the assumption that a seaman will render better service if he has some assurance that his family is free from financial and medical worries while he is at sea. Seven Merchant Marine Rest Centers were developed at strategic points on the Pacific, Gulf, and Atlantic Coasts.

These centers offered convalescent treatment to merchant seamen discharged from Marine Hospitals, and general treatment to merchant seamen suffering from disabilities not requiring hospital treatment, such as convoy fatigue. A total of approximately 9,000 patients were treated at these centers. Residence was limited to 30 days. Practically all patients treated at rest centers were returned to active duty in the industry. Many of them were so disabled because of "convoy fatigue" and other remediable psychiatric disturbances that they would certainly have

left the industry had they not been salvaged by the rest center program. The centers were maintained through the joint activities of the United Seamen's Service and the War Shipping Administration, and were administered by Public Health Service professional personnel.

Providing medical service on merchant ships while at sea was important. Radio silence was imposed due to wartime regulations; hence, medical advice by radio was not available to ships. The incidence of disabling diseases at sea was high, acute venereal diseases being especially responsible for causing work lay-offs on ships within a few days after leaving port, and being in considerable measure the cause of complaints from the military hospitals regarding the number of merchant seamen that were sent to overseas military hospitals for treatment. In some places this threatened to interfere seriously with the admission of Army and Navy patients. Finding replacements for the considerable number of men who were removed from their ships was a serious problem. For a time large replacement pools had to be maintained in the major foreign ports.

The purpose of this medical service was aimed at achieving improvements in the following main fields: (1) reduction in number of lost working days on shipboard because of disease and accident; (2) reduction in number of men taken off ship in foreign ports because of disabilities; and (3) improvement in the morale of crews while at sea.

The problem was attacked along the following lines:

(1) By including in the crew-complement of each merchant ship a staff officer with basic training in first aid and emergency medical treatment. To accompany this, a "Hospital Corps School" with a curriculum quite like similar schools in the Navy was established at the Maritime Service Training Station at Sheepshead Bay, Long Island, New York.

(2) Arrangements were made with the Coast Guard to carry a "Purser-Pharmacist's Mate" aboard each ship operated in the interest of the War Shipping Administration. Some 5,000 Pharmacists' Mates were graduated from the Hospital Corps School and at V-J Day practically every ship carried one of these ratings.

(3) The provision of adequate medical supplies. This was at times quite a difficult matter, especially with some critical items such as penicillin. These items, however, were invaluable in quickly treating some of the more acutely disabling diseases. Most of these critical supplies could not have been used without the inclusion in the crews of Purser-Pharmacists' Mates.

(4) The prevention of disabilities resulting from accidents. Accidents were a fruitful source of lost manpower and overseas hospital admissions. The problem was attacked by talks and motion pictures in Union "hiring halls," by the publication of illustrated pamphlets of the comic strip type, and by other means of making officers and men safety conscious.

(5) Participation with the Food Control Division of the War Shipping Administration in the development of a standardized food service for ships. Basic balanced diets were adopted, and "cook book" directions printed for creating daily menus from the basic materials that were common to all ships.

(6) The utilization of safety and emergency rescue equipment.

(7) The development and acceptance of sanitary safeguards throughout the fleet. These were concerned especially with plumbing, the protection of fresh water supplies, ventilation, the adaptation of new poisons such as DDT to control insect and vermin infestation aboard ship, and the like.

Captain William G. Terwilliger, USNR, was in immediate charge of these medical activities, coming directly to this post from his peacetime position of Chief Surgeon of one of the large steamship lines.

MARITIME SERVICE

Medical activities in the Maritime Service of the War Shipping Administration were begun by Assistant Surgeon General Carl Michel, Chief Medical Officer of the Coast Guard, before the Maritime Service was transferred from the Coast Guard to the War Shipping Administration in 1942. After this transfer the medical activities were, for a time, under the supervision of Dr. Justin K. Fuller, and later under the supervision of Medical Directors Mark V. Ziegler and Carl E. Rice.

The training activities were divided into three essential functions, those of the Maritime Service, those of the Merchant Marine Cadet Corps, and general supervision of certain aspects of the State maritime academies. The Maritime Service was the largest of these functions. It operated several principal types of training schools, including the enrolling offices, located in major cities throughout the United States, where applicants for training were recruited; training stations for apprentice seamen at Sheepshead Bay, New York (average of 10,000 trainees); St. Petersburg, Florida (3,000); Avalon, Catalina Island (3,000); training stations where experienced seamen were prepared for duty as licensed officers at Fort Trumbull, Connecticut, and Alameda,

California; radio schools at Gallup Island, Boston; Huntington, New York; and Hoffman Island, New York; upgrading schools where unlicensed personnel were trained for higher unlicensed jobs; specialized engineering schools for turbo-electric training and other engineering specialties; training ships consisting of 10 seagoing merchant ships and a fleet of all kinds of smaller ships, on which practical experience under intensive instruction was given to trainees. The Merchant Marine Cadet Corps operated two Basic Cadet Schools for preliminary training and the United States Merchant Marine Academy at Kings Point, New York, for the advanced training of Cadet-Midshipmen.

PHYSICAL STANDARDS

Medical standards governing enrollment were equivalent to those for enlistment in the armed services, which fact combined with the agreement of the Coast Guard not to certify anyone into the "entry ratings" who had not passed through the training program, assured the introduction to the wartime maritime labor force of newcomers who were in every way fit for the arduous demands of service afloat in wartime. During the three-year period from December 1942 to December 1945, about 467,156 candidates for enrollment were examined at 46 enrolling offices; of these candidates, 323,344 were passed. Medical control of the trainee began at the enrolling office and continued thereafter throughout his entire period of residence at the training station, where he was kept under constant medical observation and subjected to repeated tests to discover those obscure mental and physical diseases and conditions that are not readily detected at a single physical examination.

TRAINING STATIONS

The treatment of enrollees at training stations was a significant part of the program. Hospitals were designed, equipped, and staffed at each of the 11 training stations, which ranged in size from 300 to 10,000 trainees. Medical and dental offices were equipped aboard the 19 major training ships, which averaged 400 trainees for cruises averaging two weeks. During the peak war year, no less than 70,846 trainees were processed through training stations. Not only were all illnesses of minor and moderate severity treated at the training stations, but all remedial

disabilities were corrected—dental disabilities, chronically enlarged tonsils, defective vision, and the like. Men completing these training courses were without serious medical handicap.

Medical officers at training stations were responsible for the supervision of many allied activities, such as station sanitation, dietetics, and first-aid instruction.

The Purser-Pharmacists' Mates School at the Maritime Service Training Station, Sheepshead Bay, was under medical supervision. Its normal size was 600 trainees; its admission rate 50 per week; and the six months' course included 30 days of practical instruction at a marine hospital of the Public Health Service.

At the peak, the Training Organization Medical Section employed 73 physicians, 33 dentists, 17 graduate female nurses, 500 pharmacists' mates, and 20 civilian employees.

An extremely important medical function was the screening out of candidates who had personality or other mental disabilities which unsuited them for sea duty, and the provision of individual and group psychotherapy for trainees who were mildly deviant, but who offered good prognosis for eventual adjustment to sea duty. Another significant part of the medical program at training stations was to provide proper mental hygiene for trainees, and guidance for administrative personnel faced with the solution of many adjustment problems necessary during training activities.

SIGN-ON EXAMINATIONS

The fourth major activity of the Medical Division of the War Shipping Administration was concerned with the medical examination of seamen prior to signing-on for voyage. Because of the great need for men, it was not uncommon for merchant seamen who were unfit for sea duty to be allowed to sign up for voyages. This resulted in many undesirable things, such as the loss of an abnormally high percentage of manpower days at sea because of illness that should have been prevented or treated before signing-on for a voyage; in the admission to military hospitals overseas of a large number of merchant seamen; in the maintenance of unnecessarily large replacement manning pools overseas; in the unnecessary confusion and inefficiency in the maritime labor force, and in actual

danger to the healthy members thereof. The situation became so critical in late 1942 and early 1943, that drastic steps had to be taken to correct it. The purpose of the pre-employment examination of seamen was to keep the health of the maritime labor force at the highest possible level by the early detection and correction of remediable disabilities and the release from the labor force of those medically unfit for sea duty. The standards were not comparable in exactness with those governing enlistment in the Armed Forces or in the Maritime Service. Obvious reasons for this were found in the desperate need for experienced seamen and in the insistence of some labor groups that "oldtimers" be permitted to sail if they so desired. However, from a practical viewpoint, this part of the program accomplished everything that could reasonably be expected of it—it screened out literally hundreds of seamen with active tuberculosis, scores of seamen with active and dangerous mental disease, and resulted in the immediate treatment and cure of thousands of seamen who otherwise would have gone to sea with remediable conditions which would certainly have interfered with the efficient performance of their wartime duties. The rate of admissions to overseas hospitals fell sharply with the inauguration of the crew examination program, which is ample proof of the value of the program.

The routine of the crew examination devoted especial attention to the detection of communicable diseases, mental conditions, epilepsy, and acute surgical conditions, all of which are particularly dangerous among crew members at sea. As a part of this progrm, seamen were immunized against certain communicable diseases, notably smallpox, typhus fever, typhoid fever, tetanus, and, if indicated by a ship's known destination, yellow fever or cholera. Examinations were available at all principal continental United States seaports. The program augmented but did not duplicate or interfere with the examination of seamen by the shipping companies which maintained their own medical departments. Examinations were reasonably complete and included a streamlined or "production line" type of clinical examination plus blood serology, urinalysis, chest X-ray, and psychobiological personality inventory. Over 160,000 examinations were made during 1944 in the New York office alone.

A number of extremely significant facts were uncovered by this program. A surprisingly small number of men were found to be unfit for

sea duty in terms of current definitions—only about one percent of those examined. A considerable number of applicants, in addition to those who were unacceptable, were found to be temporarily unacceptable because of communicable diseases which, if untreated and carried to sea, would have not only endangered the patients themselves, but fellow crew members, military personnel, and other passengers. A significant function of the crew-examination program, therefore, was to provide immediate treatment for seamen with certain acute communicable or other minor remediable diseases. For the most part, such cases were promptly treated, which resulted in quickly returning to the industry a maximum number of experienced seamen.

ACCOMPLISHMENTS

While the medical program of the War Shipping Administration was scaled to the demands of the war situation, its fundamental concepts were steeped in a long-range industrial medical program for the maritime industry. Curiously enough, there is little or no contradiction between the wartime requirements and the long-range peacetime ideals of such a program. An industrial medical program for the maritime industry can be described as a program of medical examinations prior to signing-on for each voyage and at periodic intervals of one or two years, in order to protect the health of members of the industry; to this must necessarily be added the development of insurance, compensation, and pensioning protection to safeguard those members of the industry who become unfit for further service in it because of service-connected disabilities. It is illustrative of the fundamental common sense value of the program that although at first it was opposed by both ship operators and seamen's unions, it was finally accepted, more or less on tolerance, and ultimately welcomed during the war.

United Nations Relief and Rehabilitation Administration

During the early planning and organizational phases of UNRRA, officers of the Public Health Service played a notable part. Surgeon General Thomas Parran presided over the subcommittee which formulated the report to the UNRRA Council regarding policies on health

and medical care, and Dr. James A. Crabtree served as secretary. This report was adopted by the Council in November 1943. In the following month Doctor Crabtree, as Acting Director of Health of UNRRA, began organizing the Health Division in accord with the policies laid down, and he continued to direct the activities of the Division until June 1, 1944, when Dr. Wilbur A. Sawyer, previously Director of the International Health Division of the Rockefeller Foundation, was appointed Director of Health. Thereafter, Doctor Crabtree served UNRRA as Deputy Director of Health until September 10, 1945, when he was recalled to urgent duty in the Public Health Service. He was, however, replaced as Deputy Director of Health by another officer of the Service, Dr. A. Hughes Bryan, who had already been in the Health Division as Chief of the Nutrition Section. Doctor Bryan continued as Deputy Director of Health until October 1946, when the work of UNRRA was beginning to diminish. He was then released from UNRRA and the Service to assume his duties as Professor of Public Health Nutrition in the School of Public Health of the University of North Carolina. Sanitary Engineer Frederick F. Aldridge of the Service served for a time as Chief Sanitary Engineer.

MISSION TO POLAND

The health mission to Poland is an example of the many missions organized by the Health Division for inclusion in the over-all country missions of UNRRA. This consisted of three branches, as follows:

(1) A professional staff with a medical officer of the Public Health Service as the Chief Medical Officer, Dr. Henry A. Holle. This staff consisted of 10 persons, among whom were included physicians, nurses, sanitary engineers, and a dentist.

(2) Visiting consultants consisting of physicians, a nurse, and a dentist; and

(3) Lecturers consisting of physicians and dentists for conducting the postgraduate medical training program.

The primary purposes of this mission were to aid the professional people in the medical and health field of Poland in rehabilitating medical practice and governmental health activity, and also to bring the pro-

fessions up to date by conducting refresher courses. During the occupation by the Germans, medical and health workers had not been in contact with the great scientific progress which had taken place in other countries. Another important object of the work of the mission was to evaluate public health problems and to assist the Polish authorities in initiating and carrying on effective public health programs.

Early postwar conditions interposed many delays and difficulties which had to be overcome. A delegation was sent to Warsaw in July of 1945 to negotiate an agreement for setting up the UNRRA mission in Poland. The Public Health Service officer who had been detailed to UNRRA and chosen as Director of the Health Division of the proposed mission was the member concerned with health matters. An agreement was signed on September 14, 1945, and the urgent health work could be begun.

The assistance which UNRRA rendered to the Polish Government in the field of health may be divided into three major categories: consultant services; medical supplies and equipment; and postgraduate training. These activities were carried on from November 1945 through October 1946. Steps were also taken to reorganize and re-establish schools of nursing throughout the country.

In the field of communicable disease control, perhaps the most important contribution was the use of DDT in the prevention of typhus fever. A major outbreak of typhus fever was most probably averted by the distribution and widespread use of 900 tons of 10 percent DDT powder for dusting purposes in areas where typhus foci were present and had begun to spread. Through instruction and organization in the use of this DDT dusting powder, a repetition of the devastating typhus epidemics which occurred in Poland after the first World War was prevented. The medical supplies provided included penicillin and other drugs that were urgently needed and not available from Polish sources. Some equipment for clinics and hospitals was also made available. Consultation by the sanitary engineer members of the mission with Polish authorities in dealing with protection of water supplies, the enlargement of sewerage systems, and the establishment of measures to protect milk and food was instituted in a number of areas, as was also insect and rodent control. War conditions had greatly disturbed sanitary precautions and typhoid fever was rampant in the autumn of 1945.

With the departure of the Germans from Poland, almost all of the dental equipment had been either removed or destroyed. Complete equipment for 15 mobile dental clinics was made available through UNRRA.

A number of physicians and dentists visited Poland under the auspices of UNRRA for periods varying from a few weeks to some months and conducted postgraduate instruction in various branches of medicine and dentistry. They gave lectures to the medical and dental professions and students in the principal cities. There was an enthusiastic reception of this assistance from UNRRA all over Poland. This important part of the program was an unqualified success.

HEALTH SERVICE TO DISPLACED PERSONS

When the health work of UNRRA began, many people had fled from their homelands on the impact of war and were gathered in refugee camps, and their care was causing a serious drain on the military. In May of 1944 the responsibility for the six refugee camps in the Middle East and adjacent parts of Africa was assumed by UNRRA, and a considerable staff was sent out including in the health personnel many officers of the Public Health Service. The magnitude of the health problem is shown by the size of the population served, about 40,000 at the end of March 1945, including 15,000 children. The responsibility for both disease prevention and medical care fell heavily on the Health Division of UNRRA and required a large staff of physicians, dentists, sanitary engineers, and nurses. This early service in the refugee camps afforded invaluable experience in health work and administration in preparation for the greater problems to be faced later in the liberated countries.

After the liberation of Germany, Austria, and Italy, there was a huge population of displaced persons in the assembly centers in these countries, reaching 826,580 in May 1946. A large professional health personnel was provided by the Health Division of UNRRA, which included many Public Health Service officers as well as numerous experts from other countries. The available staff was augmented by training and supervising physicians, dentists, and nurses from among the refugees themselves. An outstanding feature which contributed to the success of this work was the extensive immunization program.

INTERNATIONAL SANITARY CONVENTIONS

The second World War broke down the administration of the international health regulations controlling quarantine, as codified in the Sanitary Conventions of 1926 for maritime quarantine, and those of 1933 for aerial navigation. These Conventions had been administered in Paris by the International Office of Public Health, but had been interrupted by the German occupation of France. The League of Nations Epidemiological Intelligence Service at Geneva had been practically isolated and its Far Eastern Bureau at Singapore had ceased to exist when the Japanese swept into Malaya.

The UNRRA Standing Technical Subcommittee on Health for Europe was the first to recognize the urgent need to re-establish the system of international quarantine. Accordingly, this body set up a Commission in London to initiate a redraft of the International Sanitary Conventions. Drs. Leonard A. Scheele and James A. Doull of the Public Health Service, acting as medical consultants to UNRRA, also served as members of this Commission.

On September 6, 1944, the UNRRA Standing Technical Committee on Health established an Expert Commission on Quarantine with headquarters in Washington. This Commission continued the redrafting of the Sanitary Conventions to bring them into accord with changed epidemiological concepts. They also dealt with the immediate problems relating to the application of the Sanitary Conventions to prevent the international distribution of diseases. The yellow fever infected areas of the world were delineated. Standards were recommended for the manufacture and control of yellow fever vaccine and methods of storage, transport, and administration. Two Public Health Service officers served on this Commission, Dr. Gilbert L. Dunnahoo as vice-chairman, and Dr. John R. Murdock as member. Dr. Milton V. Veldee served as technical adviser to the Commission.

The various duties imposed by the Conventions were performed by UNRRA from January 15, 1945, until December 1, 1946, when they were transferred by arrangement to the Interim Commission of the World Health Organization. By its administration of the Sanitary Conventions and through related reports, UNRRA had bridged a serious

gap between the interruption of the International Office of Public Health in Paris and the beginning of the World Health Organization.

PERSONNEL ASSIGNED TO UNRRA

A total of about 250 officers of the Public Health Service were on loan at one time or another to UNRRA. These officers included medical, dental, nurse, and sanitary engineering personnel. They were sent by UNRRA wherever needed and served in many parts of the world including the Middle East, Egypt, North Africa, Greece, Yugoslavia, Italy, France, Belgium, Netherlands, Germany, Czechoslovakia, Austria, Poland, and the Far East, principally in China. Obviously, it is impracticable to give a detailed account of all these missions. In fact, the story of any one of them alone would be well worth reciting.

These missions varied as to composition of personnel, immediate objectives, and method of organization. Probably no one could be considered as typical of all missions.

By assigning experienced officers to UNRRA when military needs had drawn heavily on the supply of professional personnel, the Public Health Service helped that organization to make a quick start in medical relief in war-ravaged countries, and in the rehabilitation of their health services.

Mission to Moscow

In 1943 the Soviet Government suggested to the United States Government that there be an exchange of information on certain aspects of medical research of mutual interest to both countries. Appropriate steps to effect this were taken through the United States Embassy in Moscow, the Department of State, and the Office of Scientific Research and Development.

A series of ten subjects in which there had been active, recent research developments in the United States were selected by the Committee on Medical Research of the Office of Scientific Research and Development. Reports on these subjects were prepared by American scientists for transmittal to the medical authorities of the Soviet Union. The subjects were: "British Anti-Lewisite," by Milton C. Winternitz; "Pen-

icillin," by Robert D. Coghill and Chester S. Keefer; "Typhus Vaccine," by Norman H. Topping, Richard G. Henderson, and Charles C. Shepard; "Plasma Protein Fractionation," by A. Baird Hastings and Edwin J. Cohn; "Quinacrine," by James A. Shannon; "Surgical Problems—Wound, Burns, Shock," by Allen O. Whipple; "Insecticides," by W. E. Dove; "Air Sterilization," by O. H. Robertson; "Dermatophytosis," by J. Gardner Hopkins; and "Goggles for Military Use," by Walter R. Miles.

Dr. Michael B. Shimkin, an officer of the Public Health Service, whose parents were born in Russia, was selected as a member of this mission because of his familiarity with the Russian language and knowledge of Russian science. He accompanied Dr. A. Baird Hastings, Professor of Biological Chemistry, Harvard University Medical School, and a member of the Committee on Medical Research of the Office of Scientific Research and Development of the United States Government. Doctors Hastings and Shimkin arrived in Moscow on January 14, 1944, and left on February 11, 1944.

Establishment of Quarantine Service in Japan Following World War II

It became evident soon after the occupation of Japan by American forces that in the repatriation to the homeland of Japanese troops and nationals, some method of quarantine would have to be inaugurated to prevent the introduction of dangerous pestilential diseases.

Surgeon General Norman T. Kirk of the United States Army, on October 17, 1945, requested Surgeon General Parran to make available to the Army a Public Health Service officer experienced in quarantine procedure to supervise these activities in Japan. Dr. Vance B. Murray was selected for this purpose. Doctor Murray arrived in Tokyo for duty with the Army late in October 1945. He was assigned to the staff of the General Headquarters of the Supreme Commander of the Allied Powers with the title of Port Quarantine Consultant and remained in Japan until May 1946, when he was transferred to Manila in the Philippine Islands. Dr. Mason V. Hargett, who replaced Doctor Murray,

remained in Japan until November 1946. The repatriation program was officially terminated the following month.

The principal tasks of these Service officers assigned to quarantine duty at General Headquarters in Tokyo consisted of supervising quarantine activities, making inspections, supplying technical information, planning operations, investigating procedures, correcting operational defects, and preparing directives and regulations. Army personnel were trained by the Service at the Quarantine Station at Rosebank, New York, for later assignment to quarantine duty in Japan.

Hostilities between the Allied Powers and the Imperial Japanese Government terminated on August 15, 1945. At that time, according to official estimates, there were more than, 6,000,000 Japanese nationals, military and civilian, outside of Japan, and more than a million Koreans, Formosans, Chinese, Ryukuans, and Pacific Islanders in Japan subject to repatriation to their homes. Shortly following the termination of hostilities, it was decided that displaced persons within Japan and Japanese nationals outside their home islands should be promptly repatriated. The Japanese nationals were located in diverse areas, ranging from Australia, the East Indies, Malaya, Siam, Indo-China, Burma, China, Korea, Siberia, Sakahlin, and the Kurile Islands to Canada and the United States. The proposed movement of these more than 7,000,000 persons posed a colossal task. The problems of transport, feeding, medical care, and relocation were stupendous. The health problem was complex, as the repatriates were distributed over a large segment of the earth's surface where diseases of many types were prevalent, medical care was inadequate or altogether lacking, nutrition was deficient in many, and thousands more were destitute, the victims of war and brigandry.

The Japanese Government was made primarily responsible for carrying out the repatriation. The operation was supervised by the United States forces. The Japanese supplied what ships they could, crews for United States vessels assigned to the movement, food, clothing, drugs, physicians, nurses, hospitals, and related supplies. As the Japanese Government lacked certain resources necessary to effect this operation, assistance was given principally by the United States. This included ships, fuel oil, and medical supplies. Supervisory troops included units

from the United States, Australia, New Zealand, England, and India.

In October 1945, reception centers were established at 12 Japanese ports. Each center was established, manned, and operated by Japanese. The staff included physicians, nurses, technicians, and operating personnel. The director of each center reported both to the local occupation authorities and to the Japanese chief quarantine officer in Tokyo.

Supervision of Japanese operation of repatriation stations was the responsibility of the local military commander of the United States forces who assigned a certain number of troops to this duty. These troops not only supervised these activities but also carried out interrogations and customs inspections. The line of authority extended from the local repatriation station supervisor through military channels to Lieutenant General Robert L. Eichelberger, Commanding General, Eighth United States Army, who controlled all tactical units on duty in Japan. He, in turn, received his instructions from General Douglas MacArthur, the Supreme Commander for the Allied Powers. The Public Health Service officer who was acting as Chief Quarantine Officer was attached to the Public Health and Welfare Section of the staff of the Supreme Commander.

During the time that Service officers were on quarantine duty in Japan, a little more than one year, over 6,000,000 persons were processed through quarantine. Members of the Occupation Forces are not included in these figures.

Diverse diseases were encountered among the millions who passed through quarantine—cholera, epidemic typhus, and smallpox were of primary importance. Neither yellow fever nor plague was seen. Malaria, tuberculosis, and malnutrition were especially common. Two cases of smallpox were found in 1945 and 144 cases in 1946. Although the number of cases is not great, dozens of vessels were involved.

Only 103 cases of epidemic typhus were encountered, two in 1945 and 101 in 1946. Although the number of typhus cases was relatively small, many vessels had to be detained. No cholera was seen in Japan during 1945, but in 1946 a total of 1,573 cases and carriers, with 229 deaths were encountered through the quarantine. Cholera first appeared at the Tokyo Bay center aboard ships arriving from Indo-China and South China in April 1946. A total of 20 vessels with cholera on

board were quarantined during a period of two months. As a result of quarantine measures placed in effect, the vessels and the port were cleared of all cholera by the early part of June 1946. Seventy-five thousand persons were involved and in no instance was any cholera within Japan traceable to imported infection. Subsequently, cholera infected vessels arrived at other ports. They were handled in the prescribed manner.

A confusing factor was what appeared to be prolonged incubation periods. Numerous instances occurred in which vessels had been at sea and at anchor in quarantine for six or more days before the first cases of cholera appeared. Four times within a period of 44 days at one of the ports, vessels arrived and satisfactorily passed quarantine without evidence of cholera aboard and passengers were disembarked, only to have cholera show up among those who disembarked. It was then necessary to quarantine the passengers in billets ashore. Treatment of cholera cases was provided by the Japanese in their own hospitals or aboard hospital ships staffed by Japanese. The mortality that occurred is estimate at 65 percent of the clinical cases.

Cholera was not present in Korea in 1945 or in the early part of 1946. In May of 1946 a repatriation ship arrived in Pusan, Korea, from Shanghai, China, bringing Koreans from China. The ship was infected with cholera. The vessel was given free pratique and the repatriates were released. They scattered to various parts of Korea carrying cholera with them. A cholera epidemic shortly ensued involving both the American and Russian controlled areas.

As Korea lies just across the Chosen Straits from Japan, small boats from both coasts frequent the waters between these countries. The distances and nature of the coast lines are very favorable to clandestine traffic. Through this means there is constant illegal interchange of persons between the two coasts. Cholera was brought from Korea to Japan in June 1946 in this manner. The outbreaks that occurred were in the area of Japan nearest Korea. Repeated cases occurred in which evidence of introduction by this clandestine traffic was certain. Strenuous efforts were made by the quarantine officers to induce the occupation authorities to take necessary action to suppress this traffic. A measure of success followed. A number of smuggler craft were captured. Ten of

(From USPHS Records)

A Malaria Control Unit of the Philippine Public Health Rehabilitation Program.

these boats were turned over to the Quarantine Service for official use. Thousands of Koreans were apprehended for illegal entry. Some 100 outbreaks of cholera involving approximately 1,200 persons developed in Japan during the summer and fall of 1946.

This repatriation movement into and from Japan is believed to be the largest maritime quarantine operation in history. Over 6,000,000 people were moved overseas in 14 months. The operation was carried out under difficult circumstances, as the repatriates had been scattered over a large portion of the earth. Numerous nations were involved, yet war-scarred Japan was largely spared the ravages of epidemic diseases. While cholera, epidemic typhus, and smallpox were introduced, the number of resulting cases was small and the economy of Japan was but slightly affected. Dr. Vance B. Murray and Dr. Mason V. Hargett performed their duties on this assignment with credit to themselves and to the Public Health Service.

Reestablishment of Quarantine Service in the Philippine Islands Following World War II

From the time of the American occupation of the Philippine Islands in 1898, except during the period of Japanese occupation, until the establishment of the Republic, all of the quarantine laws and regulations of the United States were applicable to, and in effect in, the Philippines. Since the establishment of the quarantine system in the Philippines by Dr. James C. Perry of the Marine Hospital Service in 1900, except during the period of the war, the Chief Quarantine Officer of the Philippine Islands was the Senior Medical Officer of the Public Health Service on duty in Manila. Under the Civil Administrative Code of the Philippine Islands, the civil government was required to appropriate funds for the payment of officers of the Public Health Service assigned to quarantine duty in the Philippines.

With the reoccupation by the United States of the Philippines in 1944, responsibility for the enforcement of quarantine laws and regulations for the time being was assumed by the Army and Navy. The War Department in the summer of 1945 requested the Public Health Service

to assign officers for the purpose of re-establishing the quarantine service of the Philippines. Dr. George G. Holdt and Sanitary Engineer Roscoe H. Goeke were assigned for that purpose. They arrived in Manila early in September 1945.

The plan of operation was worked out in conferences with the Chief Surgeon of the Army zones in the area, the Chief of Preventive Medicine of the Army of Occupation and the Port Commander. Office space was provided in the office of the Port Commander. A shed for storage of equipment was built on the waterfront. A group of officers and enlisted men were detailed to the office for training in quarantine practice. Some of the equipment and materials required were secured from Army and Navy sources in Manila. The remainder was requisitioned by cablegram from San Francisco. Automobiles for transportation in the city and boat service for travel in the harbor were provided by Army transport officers. The Navy agreed to keep the office informed on the arrival of ships from foreign ports, and their location in the harbor. By October epidemiological information was received regularly from UNRRA, through the office of the Chief, Division of Preventive Medicine, U. S. Army. Quarantine service was begun about mid-September. By early October, it was effectively in operation.

The war caused great property destruction in Manila. Sanitary facilities and public utility services were disrupted. Refuse, garbage, and sewage were scattered almost everywhere; there were always piles of food on the wharves and piers, easily accessible to animals and insects; near the waterfront were two huge dumps, each covering several acres. Conditions in the city were ideal for rat life and certain parts of it were teeming with them. Military authorities maintained a rodent control school and carried on systematic rodent control campaigns in selected areas. Trapped rats were examined for plague. Quarantine boarding officers and personnel tried trapping and the use of poisoned bait on the waterfront, but had little success. Food and garbage were too abundant. The city was sprayed from the air periodically to control mosquitoes.

Inter-island shipping companies began to operate late in 1945. International shipping to other ports in the Islands was begun early in 1946. Army medical officers were responsible for enforcement of the Quarantine Regulations at ports other than Manila until the Army closed its

installations there. Then, by arrangement with the Philippine Department of Health and Welfare, local physicians were designated as quarantine officers and handled the work as had been done before the war.

The re-establishment of quarantine work in the Philippines was carried out by Doctor Holdt, with the assistance of Mr. Goeke without unusual incident or difficulty from September 1945 until May 1946. The number of ships that passed quarantine and sanitary inspections averaged about 100 a month. A few required fumigation.

Knowing that the Republic of the Philippines would be established in July 1946, Doctor Holdt and Mr. Goeke prepared to turn over informally to the Philippine health authorities the operation of the quarantine service. They returned to the United States in May of that year. With the establishment of the Republic of the Philippines on July 4, 1946, the quarantine functions of the Philippine Islands were formally returned to the Philippine Bureau of Quarantine.

Public Health Rehabilitation Program in the Philippines Following World War II

Following the reoccupation of the Philippines by the United States armed forces during World War II, an officer of the Public Health Service was assigned to duty with General Headquarters of the Southwest Pacific during the latter part of April 1945. This officer, Assistant Surgeon General Howard F. Smith, was directed by General Douglas MacArthur to conduct an intensive survey of general public health conditions and public health and quarantine facilities throughout the Philippines as rapidly as various areas of the Islands were retaken from the Japanese. This survey, which covered the Philippines from Mindanao to northern Luzon, was completed the early part of July 1945. The findings of this survey may be summarized as follows:

1. The incidence of malaria, tuberculosis, and venereal disease had reached new and higher levels, unknown prior to the war

2. There was widespread evidence of malnutrition and beriberi.

3. More than 5,000 persons having leprosy, previously furnished care in institutions, were dispersed into the general population.

4. General sanitation, including the protection of water supplies, disposal of sewage and garbage, and waste collections, had been reduced to a level which constituted a national hazard in the larger center of population.

5. Widespread destruction of public health facilities, including laboratories, had taken place.

6. There had been complete destruction of maritime quarantine installations, laboratories, and floating equipment. As a result, there was grave danger of plague, cholera, smallpox, and other epidemic diseases from nearby infected Oriental ports.

In view of the fact that the Philippine government (reestablished after three years of occupation by the Japanese) was unable to cope with the existing health problems, Doctor Smith, at the request of General MacArthur, made a presentation of the over-all situation in October 1945, to Surgeon General Parran of the Public Health Service.

As a result of this, the Congress in December 1945, appropriated as an emergency measure the sum of $1,000,000, later increased to $5,000,000, to assist the Commonwealth of the Philippines in the reestablishment of its public health activities and for the rehabilitation of its quarantine organization. Authorization for this program to be administered by the Public Health Service was contained in the Philippine Rehabilitation Act of 1945. These funds became available early in January 1946 with June 30, 1946, as the expiration date; this date was later extended to June 30, 1950.

A program to assist the Philippine government in the solution of its public health problems was formulated and mutually agreed upon at Manila by the Secretary of Health and Welfare for the Philippines and Dr. Howard F. Smith for the Public Health Service.

Briefly stated, the objectives of this program were:

1. The prevention and control of malaria. Four to five million cases were estimated to be occurring annually.

2. The prevention and control of tuberculosis. The incidence of this disease was estimated to be from eight to ten times that in the United States.

3. The control of venereal disease, the high incidence of which was proving a serious hazard to military operations.

4. The detection and treatment of persons afflicted with leprosy.

5. The reestablishment of laboratories essential to public health.

6. The providing of safe water supplies for 80 of the larger cities and municipalities throughout the Islands.
7. The rehabilitation of the Philippine quarantine service.
8. The furnishing of smallpox vaccine (sufficient to vaccinate 100,000 persons monthly) to the Commonwealth Government pending adequate production by Government laboratories rehabilitated under the program.
9. The development of a program for maternal and child health.
10. Inauguration of plans for improved nutrition.
11. Expansion of health education.
12. Establishment of public health training centers.

On June 25, 1946, through the United States High Commissioner in Manila, the President of the Philippine Commonwealth requested permission to designate Dr. Howard F. Smith as his technical adviser on all matters of public health, sanitation, and quarantine during the operation of the program and to continue the arrangement following the establishment of the Philippine Republic. The request was granted and continued in effect until the termination of the public health rehabilitation activities on June 30, 1950.

Dr. Alonzo F. Brand of the Public Health Service was assigned to assist for a time in the venereal disease control program. Dr. Francisco Dy, a Reserve Officer of the Public Health Service, was detailed to assist Doctor Smith. The remainder of the necessary personnel was secured in the Philippines. An important part of the rehabilitation program was the sending to the United States of local public health personnel for further training and instruction at various schools of public health.

The public health rehabilitation program in the Philippine Islands proved to be quite successful. Its conclusion ended an ably conducted activity that rendered needed and essential health services to a friendly people, situated in a tropical setting where several major pestilential diseases, such as cholera, bubonic plague, and smallpox offer a constant threat.

Special Mission to Japan

The United States Strategic Bombing Survey was established by Secretary of War Henry L. Stimson on November 3, 1944, pursuant to

a directive from President Roosevelt. Its mission was to conduct an impartial and expert study of the effects of the aerial attack on Germany to be used in planning air attacks on Japan, and to establish a basis for determining the importance and potentialities of air power as an instrument of military strategy for planning the future developments of the armed forces of the United States. The Public Health Service did not participate in the investigations conducted by the Survey in Germany.

With the surrender of Japan, the Survey was given the task of conducting similar studies in that country. Secretary Stimson then requested the Public Health Service to assign a group of officers to the Survey for the purpose of assessing the effects of the bombardment of Japan from a medical and health standpoint. The following officers of the Public Health Service were detailed to the War Department and assigned to the Survey for this purpose: Assistant Surgeon General Lewis R. Thompson, Sanitary Engineer Director Ralph E. Tarbett, Senior Surgeon Robert H. Flinn, Surgeon Luther L. Terry, Surgeon Robert S. Goodhart, Sanitarian (R) Jesse B. Yaukey, and Mr. Lester J. Marier, who served as Executive Secretary.

This group was augmented by the assignment of Lieutenant Colonel Harold B. Hilton, Major Henry J. Rugo, Captain Paul J. Houser, and four enlisted men from the Army, and one enlisted man from the Navy.

The group arrived in Japan during the latter part of October 1945, and remained in the country approximately five weeks. Headquarters of the Survey was located in Tokyo. Teams carried out surveys in various Japanese cities, including Tokyo, Yokohama, Osaka, Kobe, and Kyoto, as well as Hiroshima and Nagasaki, the cities where, on August 6 and August 9, 1945, respectively, the first two atomic bombs ever used for military purposes, were dropped.

The public health and sanitary aspects of Hiroshima and Nagasaki as a result of atomic bombing varied little from the effects of demolition and incendiary raids seen in other Japanese cities. From a purely medical aspect, however, there was a very wide difference in the number and nature of the casualties and the psychological reaction of the general population. The psychological effects were evident by the mass exodus of the people to outlying areas with little regard for care of the casualties,

the complete apathy of the population, the inability of the public authorities to restore sanitary facilities, and the lack of an adequate and safe water supply.

The almost complete destruction of medical facilities and supplies in the two cities contributed to the total number of deaths, especially among the more seriously burned who were not killed outright. At Hiroshima all of the hospitals were destroyed or so seriously damaged that they were rendered ineffective. Sixty of the 200 physicians in the city were killed, and many others were injured. It took the authorities three days after the bombing to restore any semblance of organized medical care. The situation at Nagasaki was even more grave, as the large university hospital, which contained three-fourths of the city's hospital beds, was located within less than a mile from the blast and was completely demolished from a functional standpoint. The injured who fled to the hills received practically no medical care, though a few were successful in reaching distant cities where they received some treatment.

The nature of the casualties differed from those encountered in demolition or incendiary raids. There were, of course, the same type of injuries and fire burns found in other cities due to falling structures and primary or secondary fires but, in addition, there were thousands of casualties due to flash burns and radiation effects.

Many of the effects of the bombing would seem to have a tendency to cause epidemics and produce impairment of public health. The principal effects were the destruction of houses with consequent crowding and exposure, the disorganization of food supplies, the destruction of sanitary facilities, and the lack of fuel and detergents. Despite these potentially serious disease-producing conditions, there was no major epidemic in these cities and few measurable effects were seen upon the incidence of diseases normally prevalent.

The group returned to the United States in mid-December of 1945. Several months were spent in analyzing the data collected and in the preparation of reports. Two reports, "The Effects of Bombing on Health and Medical Services in Japan," and "The Effects of Atomic Bombs on Hiroshima and Nagasaki," were prepared and published.

Civilian Defense Survey in Japan

At the request of the Army, Dr. Knox E. Miller was assigned as a member of a group that made a study for the Strategic Bombing Survey in Japan. This particular study related to the effects of strategic bombing on the civilian population and industrial establishments, including measures adopted for defense.

The survey group was composed of numerous branches. The team for study of civilian defense of which Doctor Miller was a member was one of several engaged in this work. Each team was further divided into a number of specialist units. Doctor Miller was assigned as the medical member of the civilian defense team. The items covered by the medical section were: (1) first aid; (2) hospital facilities and services; (3) activities of the Red Cross; (4) gas defense; and (5) disposal of the dead. The period covered by Doctor Miller on this assignment was from October 8, 1945, to February 1, 1946.

Lasting Results of Campaigns

Perhaps the benefits of the work of the Public Health Service in war should be reported in two groups, those which are tangible and those which fall onto the intangible side of the ledger. The tangible benefits occur in lowered morbidity and death rates, and in greater emphasis by local and State health units upon the control of diseases which were then problems. Perhaps the greatest of the intangible benefits are those which result from the feeling of security that a nation can have in the knowledge that certain diseases are no longer a problem and that, should they again become a threat, we have the knowledge to combat them effectively.

This account of the activities of the Public Health Service in World War II would be incomplete without acknowledgment here of the excellent working relationships with the military and naval authorities in all contacts both in the field and in Washington. The cordial cooperation on the part of those authorities resulted in a harmonious alliance against disease, death, and the diminution of manpower, an alliance that engaged these adversaries so successfully.

CHAPTER XII

Public Health in The Mid-Twentieth Century

There is nothing permanent except change.—HERACLITUS

Mid-Century

IN the past 50 years important gains have been secured in the prevention and control of disease. It has been amply shown that scientific research can discover new knowledge and devise better methods for improving health. Increased efforts to advance medical science and to apply it widely are being actively carried forward. Expanded health services and hospitals are being made available to the general population. Individuals now seek health services and facilities more frequently and utilize them more effectively than did those of the preceding generations.

The most obvious health benefit of progress is the increase in life expectancy. Another by-product, however, is that a different and continually changing set of health problems is being faced. Among these, that of the chronic diseases is most outstanding. The Nation's rapid growth and industrial expansion in the past 50 years have created many sharp contrasts in American life. Human beings are more subjected than formerly to severe physical and mental strains. The symptoms of cultural conflict are seen in the wide prevalence of heart disease, mental illness, alcoholism, and accidents. The physical environment of the times also creates conditions that are harmful to health.

Governmental and private agencies are working for better health in communities, States, and the country as a whole. The Federal Government is taking a share of the responsibility for public health by helping

the States, communities, and private institutions to expand their programs. In 1950, the Public Health Service was able to continue its contribution to health in the United States through its programs of medical research and medical services, environmental and personal health, and of aid to official and non-official organizations. From its vantage point as the Nation's principal health agency, the Public Health Service sees large gains ahead for health in the United States and the entire world in the next half century. It is not possible, nor wise, to predict specific gains. The problems are many and complex. New knowledge can be expected from scientists, but its application cannot be foreseen. Nor can it be predicted what new problems will arise.

It is possible, however, and necessary to continue the task of strengthening and improving community, State, and national health services. If new knowledge of man in sickness and in health is to be gained and applied, there must be even stronger programs for research, medical and hospital care, and public health. Programs and services must be well organized so that they can adjust to the ever changing needs of contemporary life. They must be able to assure protection from modern hazards in every community. They must provide in every community the means for each individual to attain the fullest measure of health.

UTILIZING HEALTH SERVICES

In 1949, more than 16,000,000 patients received bed-care in hospitals in the United States. This was the largest number ever recorded. It may seem strange to count the increase of hospital patients as a sign of progress in American health. But it is a good sign that the attitude of the public toward the hospital has been changed. The people are learning to turn to it as a place where they can get modern services that will restore them to health, or better still, prevent serious illness. Fifty years ago, people as a rule went to the hospital only as a last resort. A good statistical measure of the recently changed attitude is the increase of births in hospitals. In 1949, for example, more than 86 percent of the births occurred in hospitals; in 1935, the percentage was only 37. The greater use of hospitals also shows that a beginning is being made to fill the gaps where there were no hospitals or not enough beds to serve the community. The National Hospital Program, begun by the Public

Health Service in 1946, has made it possible for many communities—large and small—to survey their hospital deficiencies and to start building the additional facilities they need.

New services in health departments also contribute to individual and family health. During 1950, about 15,000,000 people stepped before X-ray machines and had chest X-ray examinations made. As a result, more cases of tuberculosis are being discovered in the early, most curable stages. In the same year, more than two and one-half million persons visited local health departments to be examined for venereal diseases. As a result, nearly half a million were found to be infected.

POPULATION GROWS OLDER

In 1850, the average life expectancy at birth was about 40 years and by 1900 it had increased to 47 years. When the present century opened, almost one in every two persons (44 percent) was under 20 years of age. At the opening of the present century, the United States was essentially rural and rural families tended to be self-sufficient, producing units in which the aged could serve important functions. Only one in 25 in the population of 1900 had attained the age of 65 years; by 1949 one in 13 attained the age of 65 years or more.

In 1900, the United States was a nation of 76,000,000 people. By 1950, the population had about doubled. Immigration was responsible for some of the growth in population; birth contributed a large share of the increase, and the decline in death rates the remainder. The birth rate declined in the early decades of the century and reached a low in 1933. Sharp increases occurred during World War II and the post-war period and the birth rate now is near the relatively high level of the early 1920's. The large increment to the population from births during the post-war years may be appreciated from the fact that close to 15 million children were born in this country in the four years 1946 through 1949. In the four years prior to World War II, almost five million fewer babies were born.

At the same time, the death rate has continued its steady decline. Early in the century, more than 100 of every 1,000 babies born died in the first year of life. Today, the death rate of infants is less than a third of that number; for 1949 the estimated figure is 31.1 deaths under one

year per live births. Pneumonia and influenza, and tuberculosis were leading causes of death at the beginning of the century. The death rates for pneumonia and influenza have decreased by 81 percent; for tuberculosis the decrease is 85 percent. The enteric diseases—typhoid fever, diarrhea, and enteritis—were serious public health problems. Typhoid fever as a cause of death is now approaching the vanishing point; and the rate for diarrhea and enteritis has been reduced by 95 percent. Medical discoveries have almost eliminated mortality from the common diseases of childhood—diphtheria, measles, scarlet fever, whooping cough.

As communicable diseases succumbed to public health campaigns, nearly 20 years were added to the average life expectancy at birth between 1900 and 1950. As a result of these influences, children and youth represented one-third of the population, and the number of persons 65 years or over increased in 1948 to one in 14.

About 80 percent of the deaths occurring at the present time (1950) in the United States are among persons 45 years of age and over. Fifty years ago the proportion of deaths among the same age group was 46 percent. Of significance is the fact that in the past 50 years we have added only four years of the average life expectancy of persons over 40 years of age, while life expectancy at birth has increased by 20 years. In 1920, about one-fourth of all tuberculosis deaths occurred among persons 45 years of age and over. At present more than one-half of the deaths occur in that age group.

The average length of life in a nation tells a great deal about its health and other social conditions. The average American born in 1950 can expect to live about 67 years if current mortality rates prevail. In 1900, life expectancy at birth was 47 years. This 20-year gain, combined with lower birth rates before World War II and restricted immigration since 1924, has made a great change in our national "age." By 1960, it is estimated that one-third of the American population will be in the middle and old-age brackets. In 1900, the "average American" was 23 years old; in 1940, he was 29; and by 1960, he will be nearly 33.

Many factors have contributed to this important age-shift. Efforts to control communicable diseases and improve infant and child health deserve special mention. These efforts, however, could not have been undertaken nor could medical science have made its astonishing ad-

vances, without the rapid and dramatic increase of our Nation's wealth. Our national wealth has to be measured by the growth of the population, of cities and industries; by the development of the enormous natural resources. These advances have given the United States a continuously rising standard of living. These factors have made possible the American systems of public education and public health, universities, scientific research, hospitals, and other institutions for the promotion of the health and happiness of the people.

FACING THE FACTS

The increasing age of the population in such a rapidly changing physical and social environment presents a picture of health that had not previously been drawn. There are in it many new and different problems to be solved.

Heart diseases, cancer, and intracranial lesions of vascular origin (commonly called "stroke," apoplexy, cerebral hemorrhage, and the like) are now the three leading causes of death in the United States. Deaths from these causes are concentrated chiefly in the older age groups (45 and over), for these are diseases to which adults are especially susceptible. The 10 leading causes of death in 1900 were as follows:

Pneumonia (all forms) and influenza
Tuberculosis (all forms)
Diarrhea, enteritis, and ulceration of the intestines
Diseases of the heart
Senility (ill-defined and unknown)
Intracranial lesions of vascular origin
Nephritis
All accidents
Cancer and other malignant tumors
Diphtheria

In 1948, the most recent year for which final figures are available, the 10 leading causes of death are as listed below:

Diseases of the heart
Cancer and other malignant tumors

Intracranial lesions of vascular origin
Nephritis
Accidents excluding motor-vehicle accidents
Pneumonia (all forms) and influenza
Tuberculosis (all forms)
Premature birth
Diabetes mellitus
Motor-vehicle accidents

The chronic diseases are not the only major causes of death. Accidents have been among the first 10 causes of death for the past 50 years. The only entirely "new" cause of death added to the list during the years is motor vehicle accidents. In both 1948 and 1949, however, the death rate for motor vehicle accidents remained below the prewar level, despite our increased use of motor vehicles.

Deaths and death rates from heart disease and cancer have increased enormously and steadily since the turn of the century. These two causes alone now account for nearly one-half of all deaths. The death rate from heart disease in 1948 was 322.7 per 100,000 population; that is the highest death rate ever recorded for *any* cause. Cancer in 1948 had a death rate of 134.9 per 100,000. An important fact is that the death rates from heart disease and cancer have risen in all age groups 45 years of age and over. Pneumonia and influenza death rates are still highest among the very young and the very old.

The major causes of death concern no specific age group; they concern all persons. The diseases and nonfatal accidents that leave as sequelae a lifetime of pain and invalidism are also of concern. Arthritis and rheumatism, poliomyelitis, multiple sclerosis, and cerebral palsy, for example, seldom kill, but are among the chief causes of chronic disability.

Mental disease probably is the most prevalent cause of ill health and disability in the United States. More than 100 years ago mental illness was recognized as a public problem. Laws began to be enacted and institutions built to ensure humane care for the mentally ill. These early efforts occurred at a time when knowledge of diseases of the mind and the means to heal were very meager. As psychiatric knowledge increased, it began to be understood that the roots of mental illness often are the

stresses and strains imposed upon man by his rapidly changing physical and social environment.

CHANGING ENVIRONMENT

While the chronic diseases, accidents, and mental diseases were increasing, the physical environment was changing as rapidly. American industry, including agriculture, expanded steadily throughout the half century; but twice in that period, its growth was phenomenal. The first great expansion occurred in the years up to 1920; the second, in the last 10 years of the half century (1940-1950). The change has been not only in growth, but in a bewildering array of new products and new ways of marketing.

It has not been fully realized, however, that industrial expansion and the growth of cities carry also new hazards to health. Fortunately, these hazards can be met if intelligent efforts are made. Cities and industries produce enormous quantities of waste that pollute the air, streams, and lakes. Factories, mines, railroads, and homes spout unmeasured volumes of smoke, fumes, and dusts into the air. Industrial wastes and domestic sewage pour into rivers in volumes equal to what could be expected from a population of 175,000,000. The estimated population in 1950 is 152,000,000. Up to now, sufficient attention has not been given to the three vital needs: water, air, and shelter.

Splendid progress has been made in ensuring safe drinking water, safe milk, and safe foods in most parts of the country; but a new approach is needed to clean up the remaining problems as well as to solve the new ones. Present-day environmental problems cannot be solved by applying a single type of preventive measure as can safe water in a community be ensured by installing a public water supply. Each of the great river systems now must be studied as an individual problem. So must problems of community air pollution, waste disposal, and housing.

Finally, the age of atomic energy presents many entirely new environmental problems. Atomic energy will one day be the source of new industrial power and industrial expansion. Already, radioactive substances are being widely used in research, medicine, and industry. The safe handling of radioactive wastes, and the preventing of radioactive injury to human beings must be learned and applied.

NEW APPROACH

A new approach is needed to combat contemporary health problems. Chronic diseases, accidents, and mental illness require comprehensive, continuous study and treatment of individuals. In the past, some of the foremost problems could be combated with fair success by treating the environment. Public water supplies and safe milk, for example, brought about remarkable reductions in intestinal infections and infant deaths. Also, by removing an infected individual from contact with others, the spread of communicable diseases has been prevented. Later, means were developed to prevent some infections by a single preventive treatment—immunization.

Experience with tuberculosis and venereal diseases has shown that control of long-term illness requires new methods. These include: (1) a system by which early cases are sought and found among the supposedly healthy; (2) treatment of the individual until he is well; (3) physical, mental, and social rehabilitation of the individual.

TEAMWORK IN PUBLIC HEALTH

Public health for many years has been an organization of professions federated in various degrees of intimacy. All have been working toward a common goal of improving the collective health of the people. But the immediate goals and the activities of the different professional groups have differed widely. Each profession has tended to work with a good deal of independence in its own sphere. When the urgent health problems could be solved by the work of one profession, its independent action did not hinder progress. An engineer could provide a safe water supply without needing the advice of a physician. A physician could vaccinate an entire population without reference to the public health engineer. Today, the most urgent problems of public health require the combined skills of many professions to bring about a solution. To successfully carry on a public health program requires physicians, engineers, dentists, chemists, physicists, bacteriologists, bio-statisticians, nurses, health educators, and others working together as a team. Each contributes from his own professional training and experience to the solution of a common problem.

(From USPHS Records)

Mutiplescreening—a combination in one operation of several case-finding procedures.

(From USPHS Records)

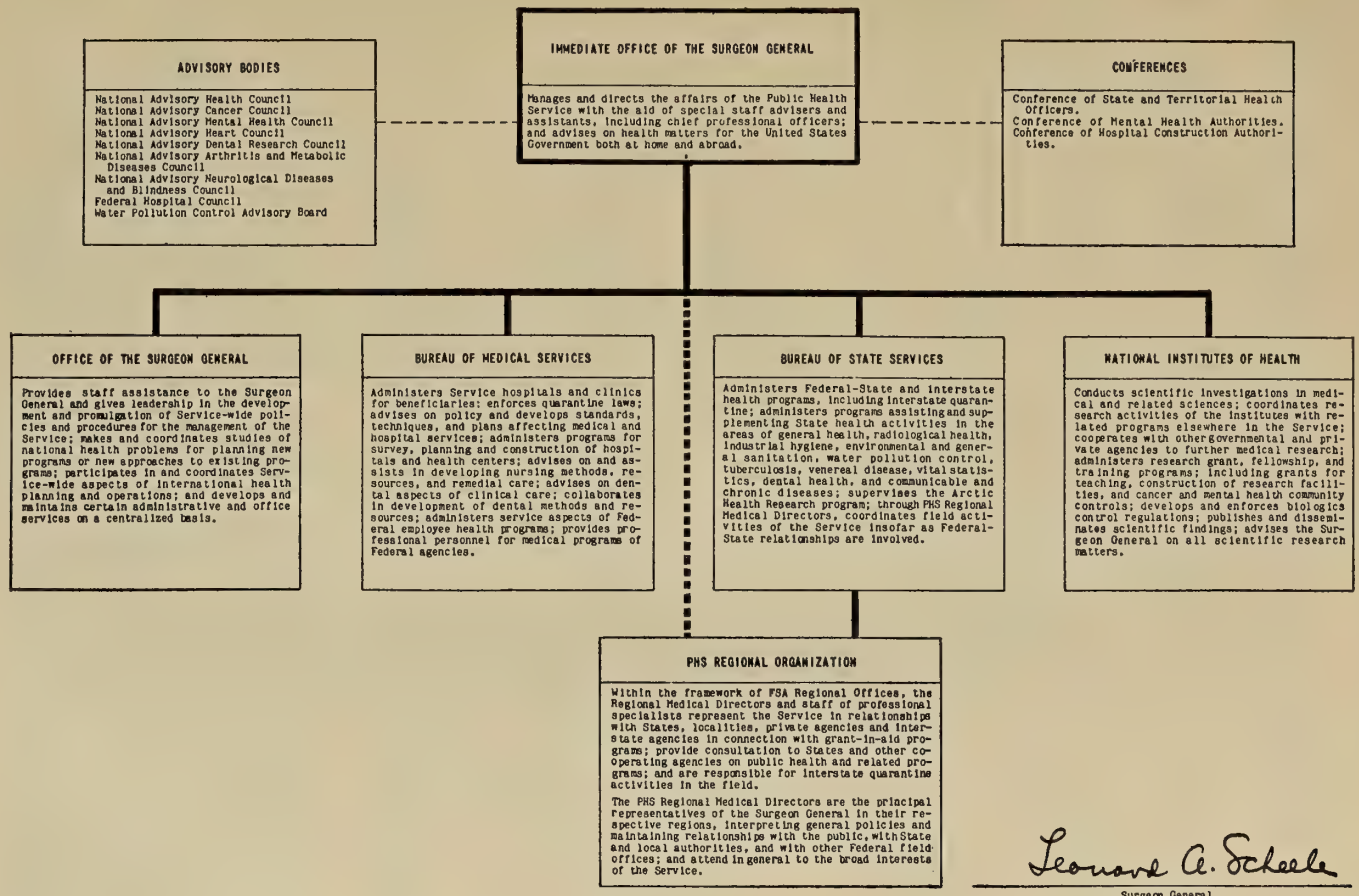
Men and women line up at a mobile X-ray unit. The Service assists in mass chest X-ray surveys ranging from personnel of single industrial plants to total communities.

FEDERAL SECURITY AGENCY

CHART 9

FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE

CHART D
November 22, 1950


ADVISORY BODIES
National Advisory Health Council
National Advisory Cancer Council
National Advisory Mental Health Council
National Advisory Heart Council
National Advisory Dental Research Council
National Advisory Arthritis and Metabolic Diseases Council
National Advisory Neurological Diseases and Blindness Council
Federal Hospital Council
Water Pollution Control Advisory Board
IMMEDIATE OFFICE OF THE SURGEON GENERAL
Manages and directs the affairs of the Public Health Service with the aid of special staff advisers and assistants, including chief professional officers; and advises on health matters for the United States Government both at home and abroad.
CONFERENCES
Conference of State and Territorial Health Officers.
Conference of Mental Health Authorities.
Conference of Hospital Construction Authorities.
OFFICE OF THE SURGEON GENERAL
Provides staff assistance to the Surgeon General and gives leadership in the development and promulgation of Service-wide policies and procedures for the management of the Service; makes and coordinates studies of national health problems for planning new programs or new approaches to existing programs; participates in and coordinates Service-wide aspects of international health planning and operations; and develops and maintains certain administrative and office services on a centralized basis.
BUREAU OF MEDICAL SERVICES
Administers Service hospitals and clinics for beneficiaries; enforces quarantine laws; advises on policy and develops standards, techniques, and plans affecting medical and hospital services; administers programs for survey, planning and construction of hospitals and health centers; advises on and assists in developing nursing methods, resources, and remedial care; advises on dental aspects of clinical care; collaborates in development of dental methods and resources; administers service aspects of Federal employee health programs; provides professional personnel for medical programs of Federal agencies.
BUREAU OF STATE SERVICES
Administers Federal-State and interstate health programs, including interstate quarantine; administers programs assisting and supplementing State health activities in the areas of general health, radiological health, industrial hygiene, environmental and general sanitation, water pollution control, tuberculosis, venereal disease, vital statistics, dental health, and communicable and chronic diseases; supervises the Arctic Health Research program; through PHS Regional Medical Directors, coordinates field activities of the Service insofar as Federal-State relationships are involved.
NATIONAL INSTITUTES OF HEALTH
Conducts scientific investigations in medical and related sciences; coordinates research activities of the Institutes with related programs elsewhere in the Service; cooperates with other governmental and private agencies to further medical research; administers research grant, fellowship, and training programs; including grants for teaching, construction of research facilities, and cancer and mental health community controls; develops and enforces biologics control regulations; publishes and disseminates scientific findings; advises the Surgeon General on all scientific research matters.
PHS REGIONAL ORGANIZATION
Within the framework of FSA Regional Offices, the Regional Medical Directors and staff of professional specialists represent the Service in relationships with States, localities, private agencies and interstate agencies in connection with grant-in-aid programs; provide consultation to States and other cooperating agencies on public health and related programs; and are responsible for interstate quarantine activities in the field.
The PHS Regional Medical Directors are the principal representatives of the Surgeon General in their respective regions, interpreting general policies and maintaining relationships with the public, with State and local authorities, and with other Federal field offices; and attend in general to the broad interests of the Service.

Leonard A. Scheele
Surgeon General

Headquarters Staff of the Public Health Service—1950

Surgeon General Leonard A. Scheele
Deputy Surgeon General W. Palmer Dearing
Sanitary Engineer Director Harry G. Hanson, Executive Officer

OFFICE OF THE SURGEON GENERAL

Medical Director Eugene A. Gillis, Division of Commissioned Officers
Mr. Roy L. Harlow, Division of Finance
Medical Director Louis L. Williams, Jr., Division of International Health
Mr. Laurence E. Ring, Division of Management Services
Mr. Raymond M. Pirie, Division of Personnel
Mr. George St. J. Perrott, Division of Public Health Methods
Mr. David S. Brunson, Division of Supply

NATIONAL INSTITUTES OF HEALTH

Assistant Surgeon General William Henry Sebrell, Jr., Director
Assistant Surgeon General Norman H. Topping, Associate Director
Assistant Surgeon General David E. Price, Associate Director
Mr. Albert F. Siepert, Executive Officer
Medical Director Victor H. Haas, National Microbiological Institute
Medical Director J. Rodney Heller, Jr., National Cancer Institute
Medical Director Cassius J. Van Slyke, National Heart Institute
Dental Director H. Trendley Dean, National Institute of Dental Research
Medical Director Robert H. Felix, National Institute of Mental Health
————, Division of Research Grants and Fellowships
Dr. Russell M. Wilder, National Institute of Arthritis and Metabolic Diseases
————, National Institute of Neurological Diseases and Blindness

BUREAU OF MEDICAL SERVICES

Assistant Surgeon General Ralph C. Williams, Chief
Assistant Surgeon General Vane M. Hoge, Associate Chief
Assistant Surgeon General Otis L. Anderson, Associate Chief
Assistant Surgeon General Bruce D. Forsyth (Chief Dental Officer), Associate Chief
Assistant Surgeon General Lucile Petry (Chief Nurse Officer), Associate Chief
Mr. Richard W. Bunch, Division of Administrative Management
Dental Director Walter J. Pelton, Division of Dental Resources
Medical Director Gilbert L. Dunnahoo, Division of Foreign Quarantine
Medical Director John W. Cronin, Division of Hospital Facilities

Medical Director G. Halsey Hunt, Division of Hospitals
Medical Director John R. McGibony, Division of Medical and Hospital Resources
Nurse Officer Director Margaret G. Arnstein, Division of Nursing Resources

BUREAU OF STATE SERVICES

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Assistant Surgeon General Joseph W. Mountin, Associate Chief
Assistant Surgeon General Joseph O. Dean, Associate Chief
Assistant Surgeon General Mark D. Hollis, Associate Chief (Chief Sanitary Engineering Officer)
Mr. E. Glen Hunter, Division of Administrative Management
Medical Director Albert L. Chapman, Division of Chronic Disease
Medical Director Raymond A. Vonderlehr, Communicable Disease Center
Dental Director John W. Knutson, Division of Dental Public Health
Sanitary Engineer Director M. Allen Pond, Division of Engineering Resources
Sanitary Engineer Director Vernon G. MacKenzie, Environmental Health Center
Medical Director James G. Townsend, Division of Industrial Hygiene
Scientist Director C. Mayhew Derryberry, Division of Public Health Education
Nurse Officer Director Pearl McIver, Division of Public Health Nursing
Sanitary Engineer Director Callis H. Atkins, Division of Sanitation
Medical Director Estella Ford Warner, Division of State Grants
Medical Director Robert J. Anderson, Division of Tuberculosis
Medical Director Theodore J. Bauer, Division of Venereal Disease
Dr. Halbert L. Dunn, National Office of Vital Statistics
Sanitary Engineer Director Carl E. Schwob, Division of Water Pollution Control

Bureau of State Services

Medical science is advancing on many fronts. New knowledge is being evolved and new techniques are being perfected. But all the advances are sterile if they are not translated into prompt and effective action in improving health and controlling disease. The task of applying knowledge to practice is done by many hands and many minds. Private practitioners of medicine and the other healing sciences, voluntary and professional organizations, local, State, and Federal agencies all play a part. The Federal share in this vast cooperative effort is the responsibility of the Bureau of State Services of the Public Health Service.

Health, like the education of children, is the concern primarily of the local community. Health service must be provided closest to the

area of need, not only so that the people who are recipients of the services may understand and support them, but also so that they may be active partners in health planning and promotion. For health is the responsibility of each individual as well as the combination of individuals called the community. But because many local communities do not have the resources to provide complete health services without outside aid, they must be assisted by the States. Standing at the apex of this pyramid of health services is the Federal government which, although farthest removed from the local community, possesses important resources and the technical competence to help bring health knowledge and protection for the benefit of every citizen.

Independent research, mainly of an "applied" or clinical nature, is carried out, such as evaluation of various kinds of treatment schedules for venereal diseases or experiments to determine the effects of industrial waste on the quality of water. Certain direct services, such as the inspection and supervision of common carriers engaged in interstate traffic are provided. But in addition to independent research and direct services, and constituting by far the most important phase of the work, are the cooperative activities with State and local health agencies.

Aid to the State and local health agencies takes many forms. The system of financial grants is an important part of many of the health programs conducted by States and localities. Technical aid in the administration of disease control activities helps State programs to function more smoothly. Upon request, specialists are loaned to State and local health departments to help solve specific problems. Demonstrations of new public health techniques and "pilot" programs not only point the way for State and local action but are also valuable educational devices. Popular informational and educational material is prepared, either in cooperation with States or voluntary agencies or at specific request, which assists States and local communities to reach their citizens with essential health information.

In addition to work with the States, there is also cooperation with interstate agencies, with management and labor, and with other official and non-official organizations. Cooperative programs with industry are of particular importance.

CHRONIC DISEASE

In the United States there has been a steady shifting of health problems over the last several decades. As the population grows older and as public health efforts begin to make strong inroads on the communicable diseases, our most pressing health problem has become the stabilization of long-term illnesses and the conservation of the health of older people. Chronic diseases are responsible for the greatest amount of death and disability in this country today and act as the largest drain on the medical care bill of the Nation.

Launched within the past two years, a concerted movement to meet the needs of the chronically ill is now gaining direction and momentum. Although this is a relatively new field in public health, those who are directing their efforts to the control of long-term illness are approaching the problem with a keen awareness of the things that need to be done. There is recognition that efforts for prevention must be unrelenting; that early detection is essential; that adequate treatment and medical supervision can go far in maintaining reasonable physical capacity; and that medical rehabilitation restores to many who are physically disabled the ability to work productively and live happily.

As part of its work of testing and perfecting new techniques, the Service has been active in studying a new case finding procedure, multiple screening, which combines tests for several specific diseases in a mass screening program. Information and technical guidance have been furnished to State and local health agencies, medical societies, and voluntary associations interested in this technique. Multiple screening promises to help detect hitherto undiagnosed chronic disease in an economical and efficient manner. Through demonstrations and studies, an attempt is being made to perfect the multiple screening process, so that State and local health agencies may avail themselves of what appears to be a promising public health measure.

TUBERCULOSIS

Once the gravest menace to the nation's health, tuberculosis, has in recent years fallen behind several other diseases as a major cause of death. However, tuberculosis remains a serious public health problem

in the United States. Although the national tuberculosis death rate had fallen to an estimated 26.2 per 100,000 by 1949, the disease is still killing about 40,000 Americans each year, and there are probably a half-million Americans who have tuberculosis and require medical and public health supervision.

Six years of tuberculosis control activities by the Service have been completed. During this period, cooperative action of the Service with State and local health departments and voluntary agencies has brought about material progress toward the objectives of the antituberculosis campaign: (1) prevention, (2) case finding and follow-up, (3) isolation and medical care, (4) rehabilitation and aftercare, and (5) economic and social protection for the tuberculous and their families. The Service assists State and local official and voluntary agencies through numerous direct services, consultation, demonstrations of new techniques, and loans of professional and technical personnel.

The work in tuberculosis by the mass survey method has expanded rapidly with wider acceptance of its value, not only in early detection of tuberculosis but also in bringing to light other chest diseases (particularly cancer) and cardiac abnormalities. During 1950, more than 2,000,000 X-ray examinations were made by photofluorographic units owned by the Service, more than 1.8 million of them in community-wide chest X-ray surveys in Denver, Boston, Salt Lake City, San Diego, and Los Angeles.

Nurses, physicians, medical social workers, and records consultants from the Service assisted each of these cities in preparing and planning for the programs, and technicians took the miniature X-ray pictures and developed the films which were read and interpreted by medical officers of the Service. There has also been participation in the planning and execution of the follow-up of cases discovered during the survey, as well as the setting up of case registers and records.

Working with health officers, tuberculosis control officers, and the National Tuberculosis Association, the Service has made efforts to formulate generally acceptable standards for the reporting of tuberculosis cases. Accurate and meaningful information on cases, suspects, and contacts is a basic prerequisite to effective control of the disease.

Records consultants helped various health departments to revise their record systems and, as a result, to improve case supervision and tuberculosis control operations in general.

One of the primary concerns of those dealing with tuberculosis is the problem of its prevention and treatment. With appreciation of the importance of this problem, there has been a continuing program of research into chemotherapy, diagnosis and epidemiology, prevention, and other related fields. Projects completed during 1950 have revealed that streptomycin therapy has value in the treatment of many cases of pulmonary and miliary tuberculosis, but that its action in the meningeal form of the disease is rather disappointing. Another undertaking has centered around the problem of the detection of early tuberculosis by tuberculin testing, the interpretation of equivocal or "doubtful" reactions, and the differential diagnosis, by skin tests, of tuberculosis and the various fungus diseases (particularly histoplasmosis) which may stimulate it.

Studies of immunization against tuberculosis by means of the Bacillus Calmette-Guerin (BCG) vaccine have been extended. Programs designed to assay the efficacy of various forms of the vaccine, as well as several different modes of administration, have involved some 268,000 persons in Puerto Rico, the Virgin Islands, Columbus, Georgia, and elsewhere.

VENEREAL DISEASE

The Nation moved closer in 1950 toward the goal of conquering venereal disease. Reports from health departments indicated that the steady downward trend in total numbers of cases of syphilis and gonorrhea continued during the year. Both mortality rates and admissions to mental hospitals because of syphilis declined. Of the several stages of syphilis, only congenital syphilis failed to show a substantial decrease.

Although these latest data are encouraging, syphilis continues to be a major problem in the United States during 1950 because:

1. Over 230,000 cases of syphilis were newly reported in the continental United States.

2. Almost 14,000 cases of congenital syphilis and more than 32,000 cases of early infectious syphilis were reported.
3. Syphilis caused the death of an estimated 8,200 persons in this country in 1949, the latest period for which mortality figures are available.

To combat this important public health menace, State and local health departments plan and conduct campaigns to find persons with venereal disease and bring them for treatment, either in their own clinics or by private physicians. These departments also provide the diagnostic and laboratory services necessary in venereal disease control. The Public Health Service aids the States to finance and administer their control programs and to find the best methods of case finding and treatments, and also collects and analyzes pertinent statistical data.

The importance of case finding in venereal disease programs is reflected in the number of diagnostic observations completed in State and local venereal disease clinics. The tentative figure for the year is 2,612,000 observations. As a result, almost half a million cases of venereal disease were diagnosed.

Although newer forms of penicillin have made it possible to treat syphilis on an outpatient basis, the volume of referrals to inpatient treatment centers continued to be large in 1950. For example, clinics referred 60 percent of the 19,000 cases of primary and secondary syphilis and 45 percent of the 41,000 cases of early latent syphilis they had diagnosed to rapid treatment centers or other inpatient facilities for treatment. Nevertheless, admissions to rapid treatment centers have paralleled the decline in the reported cases of syphilis. Thus, in 1950, the number of patients treated in rapid treatment centers was 18.7 percent below the 1949 figure.

The Public Health Service made allotments to 53 rapid treatment center projects in 1950. These funds helped to provide treatment services in 40 States, the District of Columbia, Alaska, Puerto Rico, and the Virgin Islands.

Basic and clinical research in venereal disease form the root from which spring technical improvements in the venereal disease control program. Investigations conducted under the control program are attempting to solve the unknowns of venereal disease. Research projects

(From USPHS Records)

Multiple chain procedure for topical application of fluoride to prevent dental caries.

(From USPHS Records)

Dr. Bruce D. Forsyth, Chief Dental Officer since 1948.

are conducted in Federally operated laboratories and research centers as well as in independent nonprofit institutions aided by financial grants.

A promising research finding in serologic testing for syphilis involves the use of specimens of blood collected from heel or finger puncture and dried on filter paper. Should evaluation of this procedure, known as the filter paper microscopic (FPM) test, bear out its early promise, it will give venereal disease control workers a simple method, for use under field conditions, of collecting specimens from infants and young children.

DENTAL HEALTH

The year 1950 saw one of the most common of all ailments, dental decay, attacked on many fronts. The new preventive measure, sodium fluoride, was brought to more communities than ever before and research in this field continued to grow. The war against oral cancer was fought with increased vigor through short courses for dentists on cancer diagnosis and control. The completion of the first full year of a dental public health program played an important part in the upsurge of interest and progress in the field of dental health.

During the year some 200,000 children in 415 communities received applications of sodium fluoride, a chemical compound which reduces new dental decay in children by 40 percent. Thirty-nine dental teams were organized to demonstrate the new technique and to stimulate community fluoride programs. Since the start of the demonstration program in the fall of 1948, 285 communities have established programs that will bring the benefits of this preventive measure to all children. About 100 more have made plans for setting up the program in the future. Community dental health programs provide such basic services as: (1) dental inspections, (2) applications of sodium fluoride, (3) referral to family dentists, (4) follow-up services, (5) care of children whose parents are unable to pay for dental services, and (6) dental health education.

In some communities, the shortage of dentists and dental hygienists is proving a stumbling block to the establishment of local programs. The nation has approximately 7,000 dental hygienists and only 20

schools of dental hygiene. Last year the schools graduated about 600 students. Some 3,000 dental hygienists would be needed to staff State and local fluoride programs alone, if these programs were established throughout the country. The demonstration program is helping inform the people on the need for more schools for dental hygienists and is stimulating interest in this field. During 1950 specific plans were made for opening four new schools of dental hygiene.

Studies to develop and test other preventive measures are being continued. Major emphasis was placed on the fluoridation of water supplies to reduce dental decay, on the defluoridation of water supplies which contain excessive fluorides thus causing discoloration of the teeth, and on the measurement of dental care needs of children.

A project to determine the value of adding fluorides to communal water supplies as a means of preventing dental caries is being conducted in Grand Rapids, Michigan, in collaboration with the National Institute of Dental Research and the Michigan Department of Health. Begun in 1945, this project will require several more years before it yields any conclusive evidence. The fifth annual examination of 6,000 children in Grand Rapids and 2,500 in Muskegon, Michigan, the control city, was completed during 1949. Preliminary findings indicate that fluoridation reduces the incidence of dental decay in the permanent teeth of five, six and seven year old children. No benefits have been found, however, for children between the ages of nine and 15.

Water supplies containing from one to 1.5 parts of fluoride per million parts of water are associated with a decrease in dental decay. Although higher concentrations reduce dental decay, they also produce an objectionable discoloration of the teeth (endemic fluorosis). The problem thus becomes one of removing excessive fluorides so that the beneficial effects can be retained without a noticeable discoloration of the teeth.

More than 8,000 children are participating in dental care projects in Woonsocket, Rhode Island, and Richmond, Indiana. Conducted by the Public Health Service in cooperation with local authorities, these surveys are designed to determine dental needs, personnel requirements, and the cost of providing initial and continuing dental care for children. The third series of treatments is now under way. Because of the back-

log of dental needs, the first series of examinations and treatment took two and one-half years. In the second series, which required approximately a year and a half, somewhat less dental care was needed and the number of extractions per child was substantially lowered. It is anticipated that the third series will be completed within a year, when results of the entire survey will be analyzed.

COMMUNICABLE DISEASES

The Communicable Disease Center, with headquarters in Atlanta, Georgia, works with the States in controlling communicable diseases.

The work of aiding States falls into five general categories: (1) field investigations, (2) operational programs, in which the actual operations are performed with personnel and material supplied by the Service, (3) laboratory services, (4) training services, and (5) epidemic and disaster aid to State health departments in nonmilitary emergencies.

Among the field investigations, the first year of a projected five-year study of the possible influence of fly control upon the transmission of poliomyelitis in five widely separated cities in the United States was completed. This study has brought the confirmation of the supposed correlation between the effectiveness of chemical control of flies and the local sanitation level. A similar study sought to find out whether the anti-fly campaign would reduce the prevalence of diarrheal diseases in several Georgia communities. The results so far show that direct action against flies by means of quick-killing and residual sprays leads to a significant decline in the dysentery (*Shigella*) infection rate, but fails to lower the prevalence of *Salmonella* infections. Improved garbage collection alone, without other control measures, did not reduce fly populations enough to affect their transmission of diarrheal diseases.

Four plague survey teams of the Western Communicable Disease Center laboratory at San Francisco, California, working from North Dakota to Texas, collected 33,086 wild rodents from which 67,202 fleas were removed and examined. Plague was found to exist in seven of the States, with new foci in four areas of Kansas and New Mexico.

An intensive campaign to eradicate malaria by supression of malaria-carrying mosquitoes by means of residual spraying has brought results

in 13 southwestern States. For the first time since the malaria field investigation and observation stations in Georgia, South Carolina, and Arkansas were established, an entire year has passed without a single case of the disease in these States being reported. Epidemiological reports indicate a continued decline in the incidence throughout the area covered by the program.

There has been a change in the orientation of the program for fighting murine typhus by eradicating the vector, the oriental rat flea. In the 11 southern States where the disease is endemic, the operations against the flea and the rat which carries it are now concentrated in areas of known foci of infection. Thus, cooperative Federal-State control programs were undertaken in 109 pre-approved counties in 1950, as compared with 188 in 1949. Within these areas, there has been less stress on DDT dusting against the flea and more on anti-rat measures.

The Communicable Disease Center, in Atlanta, Georgia, in collaboration with the Division of Foreign Quarantine of the Service, has tested some 64 different preparations designed to kill insects carried on intercontinental aircraft. One of these, experimental formula S-43, is more toxic to insects than the standard formula, less expensive, and nontoxic and relatively nonirritating to human beings.

The laboratories of the Center improved and expanded their services to States and other public agencies in the fields of laboratory diagnosis and analysis, research on methods, consultation, and evaluation of State programs. Taking part in the work were units concerned with parasitology, virus and rickettsial diseases, serology, general bacteriology, enteric bacteriology, mycology, tuberculosis, clinical pathology, nursing research, diphtheria, and streptococcal and venereal diseases.

HEALTH IN ALASKA

Alaska's strategic and economic importance gives the Territory a unique position in American planning, both in peace and in times of emergency. In a special program, the Public Health Service seeks to protect Alaska's first line of defense—its people—and to find the facts or inadequately known factors about life and health in the Arctic.

The program, now entering its third year, has continued to grow as needs have become more pointed. It has two major phases. The first

is devoted to helping the Alaska Department of Health raise the level of health throughout the Territory. For example, the Public Health Service has strengthened Alaska's health program by operating mobile health units, via ship, rail, and highway, in sparsely populated and widely separated localities. Approximately $950,000 of grants-in-aid funds have helped support various health services in Alaska. The second phase of the program involves research and investigation into special health needs and problems under Arctic conditions. Considerable progress was made during the year in several research projects conducted by the Public Health Service field station in Alaska, now termed the Arctic Health Research Center. Research is under way in such fields as animal-borne diseases, environmental sanitation, entomology and insect control, biochemistry and nutrition, physiology, bacteriology, and parasitology.

Several notable developments were recorded during 1950. Definite evidence was found of human infection with such diseases as echinococcosis (hydatid disease), trichinosis, and broad fish tapeworm infestation. Investigations in animal parasitology have resulted in the discovery of eight new species of animal and bird parasites which may have public health significance.

A three-year study of the effects of DDT control measures in cold climates is nearing completion. Recent findings indicate that the newer forms and improved methods of DDT spraying are effective against the black fly larvae in Alaskan streams without appreciable damage to fish or fish food. Widespread use under a variety of circumstances of the aerosol spray unit developed in 1949 for the control of adult insects has produced additional proof of the effectiveness and economy of this procedure in Alaska. Efforts are still being made, however, to improve the design of the apparatus and increase its mobility. Long-range studies have been begun of both community and private water supplies and of sewage disposal systems. A special study of accidental and violent deaths in Alaska was also undertaken during the year.

HEALTHFUL ENVIRONMENT

The development of adequate sanitation programs in State and local health departments is the principal stepping stone to a healthful en-

vironment. Assistance is given to States and communities to strengthen these programs in order not only to prevent the interstate spread of disease but to create ultimately an environment which produces physically and mentally sound citizens.

In this field, the Public Health Service has four principal areas of responsibility: (1) municipal and rural sanitation—this program concentrates on the prevention of home accidents, provision of sanitary safeguards in institutions and recreational areas, protection of water supplies, including swimming pools, and the proper disposal of refuse; (2) the protection of health aboard interstate carriers, including prevention of the spread of communicable diseases from one State to another; (3) the improvement of milk and food sanitation and the prevention and control of milk-borne and food-borne diseases; and (4) guarding against the health hazard of impure shellfish.

The Service continues to assist States, localities, and industries on special water supply problems. For example, assistance is being given the Kansas State Board of Health in studying the part water may play in the transmission of histoplasmosis.

Progress was made during 1950 in promoting sanitary methods of refuse disposal. In two States exploratory steps were taken to study the hog-rat-garbage-trichina cycles and a study is under way in Jasper, Indiana, of the effects on municipal sanitation of a community-wide installation of home garbage grinders. In a particularly significant study of sanitary landfills in sub-zero weather at Mandan, North Dakota, it was disclosed that this method of refuse disposal is practical and suitable in any of the northern States.

The Public Health Service took steps to counteract the rapid rise in suburban sanitation problems growing out of the Nation's record-breaking home-building program. Some primary investigations were made of these problems in several States. Such measures as the Wisconsin Town Sanitary District law are aiding in the control of public health hazards in these areas. Basic data have been provided to State health departments on sanitary district enabling laws of this nature.

The work of promoting healthful conditions aboard interstate carriers can be divided into three categories:

(1) Construction of land, sea, or air carriers in accordance with proper sanitary safeguards. During the year 26 sets of plans were reviewed and approved in connection with the construction, reconstruction, or repair of trains, buses, and airliners. Shipbuilders and equipment manufacturers submitted approximately 1,000 ship plans, of which 124 were returned for alteration. Forty Certificates of Sanitary Construction were issued during 1950 to newly constructed or converted vessels.

(2) Regular inspections to guarantee sanitary conditions aboard carriers while en route. About 2,400 inspections of ships were made in 1950, and Certificates of Compliance were issued to 334 vessels meeting all sanitary requirements. Inspections have also been made of 1,824 of the 2,200 railroad dining cars in operation. At the mid-year point, the average sanitation rating for these carriers was 70 percent, or a six percent improvement over ratings issued a year earlier.

(3) Inspections to ascertain that milk, food, and water supplies placed aboard carriers meet Federal, State, and local health requirements. Because sound construction and operation of a carrier alone offer no guarantee against loading contaminated foods, milk, or water on board, considerable effort is devoted to checking the sanitary quality of the sources of these products. State health agencies inspect the approximately 1,200 sources of water supply serving interstate carriers and United States ships in foreign trade at least once a year and forward their findings to the Public Health Service.

As part of its program to prevent and control milk-borne and food-borne diseases, the Service prepares and distributes a comprehensive report of disease outbreaks conveyed through water, milk, and other foods. The report for 1948 shows a total of 11,660 cases of disease in 375 outbreaks traced to contaminated milk, food, or water. Of these, 21 outbreaks were traced to water, 17 to milk and milk products, 327 to other foods, and 10 to undetermined sources. Reported outbreaks of food-borne diseases have been increasing steadily in recent years, whereas those from water and milk have been steadily declining.

Model ordinances and codes have been developed by the Public Health Service for the sanitary control of milk supplies, frozen desserts, and eating and drinking establishments. Widely accepted on a volun-

tary basis by States and municipalities, these standards have helped promote uniformity in milk and food control programs throughout the United States. The Standard Milk Ordinance recommended by the Public Health Service now protects the milk supply of over 58,000,000 Americans. The code for restaurants and eating establishments has been adopted by 212 counties and 529 municipalities in 44 States and Alaska, affecting some 70,000,000 people.

WATER POLLUTION

Polluted rivers and streams present a serious public health problem. Sewage and waste of every kind are being emptied into rivers in increasing quantities, much of it with little treatment or none at all. Flowing streams have great natural ability for self-purification, but many rivers are now being polluted far beyond their capacity to cleanse themselves. Not one of the 250 river basins of the United States is today free from pollution. Many parts of numerous rivers have reached cesspool conditions. Pollution brings its own attendant evils—spoilage, stagnation, and disease.

Under the Water Pollution Control Act of 1948, the Public Health Service was given the responsibility, in cooperation with other agencies, for cleaning up the contaminated waterways. Completing its first year of existence on June 30, 1950, this program has made significant advances toward improving the quality of the national water resources.

To focus attention on water quality and needs at the source, the Public Health Service established 10 river basin offices to correspond to the important drainage areas in the country. Comprehensive reports are now being prepared on the approximately 250 individual river basins within the drainage areas. The reports, scheduled to be completed in 1951 and 1952, will also carry recommendations for corrective action at each source of pollution.

The Water Pollution Control Act authorizes $22.6 million a year for five years for loans to States for the construction of sewage treatment works, and grants of $1,000,000 a year to State and interstate agencies for research in water pollution control. No funds have yet been made available for construction loans. For the year 1950, grants of $825,000

(From USPHS Records)

Mark D. Hollis, Chief Sanitary Engineering Officer since 1948

were allocated among the States, and $175,000 to States and interstate agencies for special projects. Reorganization Plan No. 16 dated March 13, 1950, made the Public Health Service responsible for administering grants to States and municipalities for plans for treatment works. The sum of $200,000 was available for this purpose in the year 1950.

The Public Health Service is assisted in the work of water pollution control by several official and nonofficial groups and committees. The Water Pollution Control Advisory Board, established by the Act, consists of representatives of Federal, State, and local agencies, and of industry, conservation groups, and others concerned with water resources. The Board has urged industry and local communities to take immediate remedial measures without waiting for Federal financial assistance to aid construction. It has also emphasized the responsibilities of the States in water pollution control.

At the invitation of Surgeon General Scheele, 22 major industries have voluntarily organized a National Technical Task Committee on Industrial Wastes. Among the tasks which the committee has undertaken are: (1) the development and adoption of practical methods of reclaiming, reducing, and treating wastes; (2) the promotion of more effective cooperation between industry and official agencies; and (3) the dissemination of information on developments in this field. Four working groups, composed of representatives from such industries as food, minerals, chemical processing, and a general industrial group, have been appointed to carry out the work of the task committee.

HEALTH OF WORKERS

America's industrial might, so important to national economy in peace and so vital in time of emergency, depends mainly on the vigor and productivity of the men and women who run the machines and guide the plows. Because the health of our industrial workers has been maintained at a high level, this country has been able to forge ahead to new achievements. But constant vigilance is necessary to protect the worker's health. Disease still lurks in the factory and on the farm. Each day, additional groups of workers are confronted with new dangers—hazards created by the use of new substances and new processes in industry.

Each technological advance brings forth a potential health problem that must be studied.

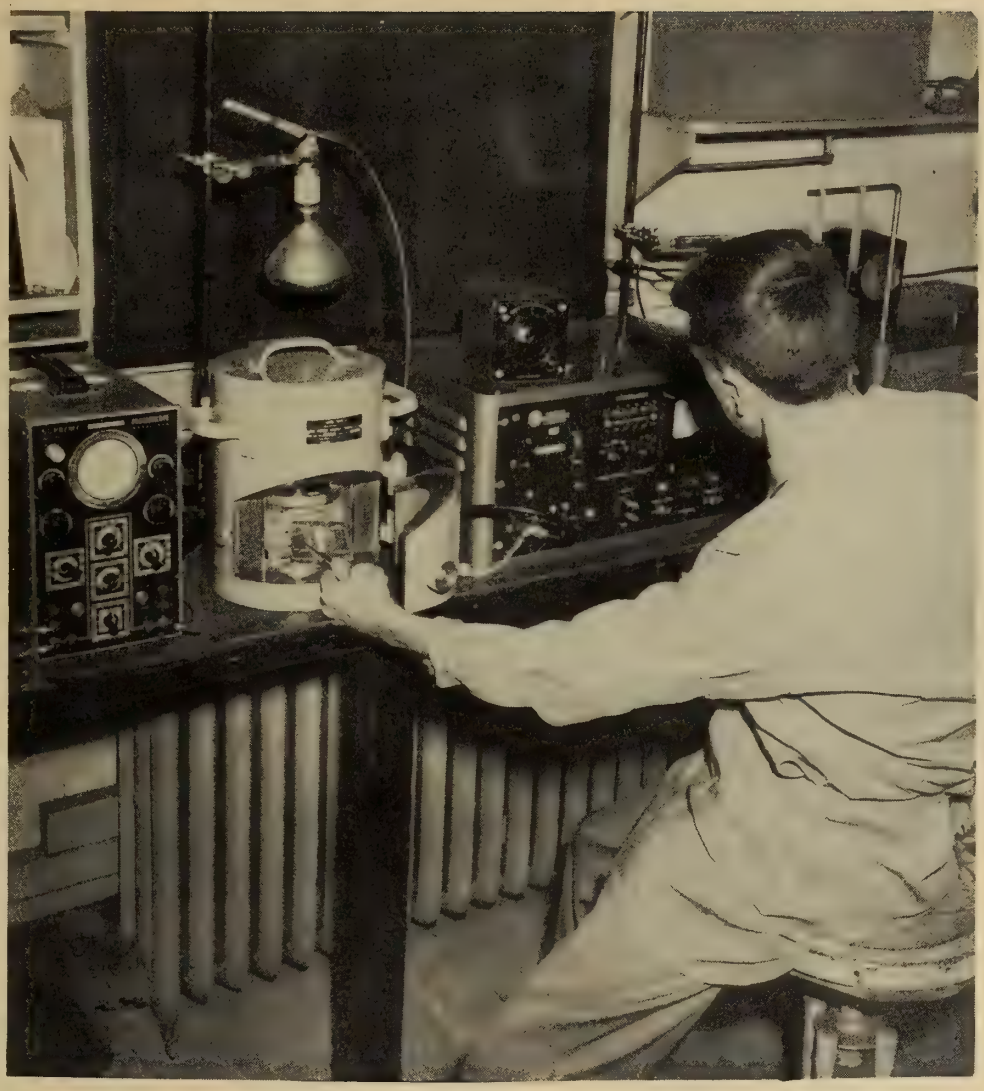
The safeguarding of industrial health and the solution of these special problems call for specialized knowledge, which has been built up since 1910. This work calls for teamwork among many skills and professions. In physical examinations, physicians and dentists intensively scrutinize workers exposed to suspected hazards. Industrial hygiene engineers go into plants to make on-the-spot checks for dangerous dusts and other contaminants. In the laboratory, chemists make analyses to identify harmful substances. Through experimental work, toxicologists simulate hazardous exposures to help arrive at safe limits. Pooling their skills, industrial hygienists demonstrate again and again that no working environment need be harmful to health.

In field investigations, considerable attention has been devoted during the year to studies of radiation hazards in the mining and milling of uranium ore. Medical and engineering investigations have begun in the mining and milling areas in the Colorado plateau, where more than 2,000 workers are employed. Preliminary studies indicate that, unless proper safeguards are utilized, lung cancer may result from exposure to vanadium and to silica dust.

A nation-wide investigation into the possible relationships of health hazards associated with the manufacture of chromates and bi-chromates to cancer of the lung has been launched. Preliminary medical and engineering work has been completed in this study, which affects some 1,500 workers, employed in seven plants of the industry.

In the field of industrial toxicology, there has been emphasis on investigations of poisoning from exposure to metal fumes, gases, and dust, from contact with organic solvents, plasticizers, synthetic resins, and unusual substances rapidly gaining importance in industry. For example, industry has requested information on the toxicity of methylal, an effective new low-boiling solvent for many carbon compounds. Preliminary results indicate that while methylal has certain narcotic properties, it has a relatively low toxicity rating in comparison with many other industrial solvents.

Industrial anthrax is a problem which has become increasingly serious since World War II. Studies of this disease, prevalent among workers



(From USPHS Records)

Radiological laboratory equipped for measuring radioactive components in air, land, and water.

(From USPHS Records)

Demonstration unit—residual spraying for flies.

handling imported wool, hair, skins, and hides, have traced the majority of the cases to industries which process carpet wool. Samples of carpet wool imported from various parts of the world have been collected for further study. Preliminary investigations have already indicated effective agents for industrial disinfection. One in particular, ethylene oxide, offers great promise as a disinfectant.

An acute respiratory disease occurring among many workers handling low-grade stained cotton has been attributed to an endotoxin liberated by *Aerobacter cloacae,* a germ found in sewage. Year after year, scientists have been checking the ability of the organism to remain alive in contaminated stored cotton, where it grows on immature cotton fibers. Recent tests have shown that the germ still survives after six years of storage.

In response to increasing requests from labor and management for information on both in-plant medical and prepayment programs, there has been expansion of studies of industrial health and welfare services. Work has been under way to collect and analyze detailed information on individual medical care plans in industry and on voluntary prepayment health programs serving industrial workers. Data of this nature should help answer such questions as: the number of persons covered by a program; the volume of service provided; and the cost, quality, organization, and administration of the services. Particular attention is being given to recent collective bargaining agreements which include health programs in their provisions.

ENGINEERING NEEDS AND RESOURCES

Engineering is at the core of many public health activities, particularly in the environmental health field. One of the important responsibilities of the Public Health Service is to offer leadership and guidance to States and localities in this aspect of their health programs. An important task is to develop standards and work out new approaches in order to improve the nation's environmental health program. Data are gathered, techniques are tested and perfected, and feasible programs are formulated.

Two new areas of environmental health work are being studied, the hygiene of housing and radiological health. Advice is furnished to

State and local health departments on housing codes and on the enforcement of minimum health standards for the maintenance, use, and occupancy of existing housing. Information and advice are also given on request to official and nonofficial agencies on the health aspects of housing.

The first full year of effort on the radiological health field has witnessed the beginnings of training programs by Federal, State, and local agencies. New attitudes toward radiation hazards are also becoming apparent, replacing the lethargy that existed before 1945 and the unwarranted over-anxiety that characterized the early postwar years. The public is beginning to face the prospect of high energy radiation with calmness rather than fear, in the belief that State and local agencies will develop plans that will assist in protecting them from the potential dangers. If public health agencies are to live up to that confidence, then more and systematic training in the public health aspects of radiation must be made available to Federal, State, and local workers.

RESEARCH IN ENVIRONMENTAL HEALTH

The Environmental Health Center, with its base laboratories at Cincinnati, Ohio, is the research and investigation center of the Public Health Service in the field of environmental health. While improvements in cleaning up the environment have given rise to considerable advances in health in the past, there are many problems still to be studied about environment. The effect of housing on health, the treatment of sewage and industrial wastes, and the health hazards associated with radioactive materials are but a few of the fields in which existing knowledge is incomplete. Dedicated to finding answers to these and other perplexing questions, the Environmental Health Center works to make the environment safer and healthier.

A staff of physicians, engineers, biologists, bacteriologists, chemists, and radiologists form a working team in the battle against environmental hazards. Through programs in laboratories, field surveys and investigations, and consultation and training for State, local, and other environmental health workers, this team provides services and guidance in a nation-wide effort to improve environmental health.

During the year 1950 several studies were begun or continued both in the field and in laboratories, which are contributing to knowledge of the environment and the ways in which it can safeguard health. As a result of studies in the disposal of radioactive waste, for example, practical methods for the treatment of certain wastes were evolved. Investigators also evaluated the effectiveness of new detergents and sanitizing agents, including the quaternary ammonium compounds used in dairy and restaurant sanitation. An exhaustive study of sewage disposal systems in individual households has already yielded facts expected to lead to significant new practices in this field. Considerable work has been done as to the way in which various industrial wastes, including fluorides, cyanides, cobalt, and chromium compounds, affect the natural ability of water to purify itself. Studies are also under way to obtain basic bacteriological and epidemiological data necessary to develop standards of quality for natural bathing waters.

Field investigations have been devoted largely to studies of water pollution and industrial wastes and to an inventory of water and sewerage facilities in the United States. Three water pollution surveys were completed during 1950, at the basins of the Kansas and the South Platte rivers and at the boundary waters between Canada and the United States in the Lake Erie and Lake Ontario section. As a result of these studies, detailed plans have been made to clean up the pollution in these areas.

Advanced training courses were conducted for chemists and engineers in water pollution control and industrial waste survey methods, for bacteriologists in work involving analysis of water, milk, and dairy products and examination of food utensils.

GRANTS FOR STATE AND LOCAL HEALTH WORK

Federal financial grants to the States, and the accompanying advisory service provided by the Public Health Service, continue to play a fundamental role in assisting States to improve existing health programs and to begin new ones. By the end of 1950, virtually all States were participating in the various health programs aided by the Federal grants.

Appropriations for State grants for public health services in 1950 amounted to more than $45,000,000 (exclusive of funds granted under

the Hospital Survey and Construction Act). Reports coming to the Public Health Service indicated that the nation's total investment in public health services amounted to an estimated $231,000,000, exclusive of funds for general hospital care, tuberculosis sanatoria, and those identified as costs of construction. Of this sum, States appropriated $96,000,000 and localities, $90,000,000. In all, Federal grants provided approximately 20 percent of the total sum expended for public health services for the year.

Grants to the States for public health services increased approximately $5.5 million over the amount appropriated in 1949. Increases were noted for general health activities, for cancer control, and for the new program of heart disease control and water pollution control. However, the grants for veneral disease control were decreased by approximately $1.5 million.

A total of $100,735,554.48 in grants was certified during 1950 for payment to the 48 States, four Territories, the District of Columbia, and six interstate water pollution control agencies. Payments were as follows:

Venereal disease control	$ 7,744,862.05
Venereal disease rapid treatment facilities	4,168,320.63
Venereal disease special case finding projects	824,969.17
Tuberculosis control	6,781,262.95
General health	14,081,127.78
Mental health activities	3,293,697.00
Heart disease control	1,769,842.00
Cancer control	3,245,711.00
Industrial waste studies (water pollution)	996,427.00
Hospital survey and planning	103,984.13
Hospital construction	56,968,233.77
Special grant to Alaska	757,117.00
TOTAL	$ 100,735,554.48

Staff members of State health departments rose above the 20,000 mark during 1950, and the States increased their efforts to train personnel for expanding health services.

As new grants have been added to the public health family, the number and variety of State agencies responsible for administering the various programs have steadily increased. This has multiplied the already complicated mechanism of processing and certifying grant programs. For example, in only 22 of the 53 States, Territories and Possessions do the health departments administer all nine health programs for which Federal grants are made available. Eight States have separate hospital survey and construction authorities; 16 have separate mental health authorities. Grants for industrial waste studies, authorized under the Water Pollution Control Act, are administered by 10 interstate agencies, and in 19 States by separate commissions.

VITAL STATISTICS

Vital statistics are the yardsticks of progress and problems in public health. Information obtained through vital records has a direct influence on the planning and administration of health activities in each of the States. Statistical reports are also useful in commerce and industry and provide the basic data for the study of social and economic problems.

The Public Health Service helps States, communities, other governmental agencies, and foreign countries to gather and use vital records effectively. For example, aid is given the States to maintain and improve the completeness and accuracy of statistics on birth, death, stillbirth, reportable diseases, and marriage and divorce. The Service works with many groups and organizations to improve the methodology of vital registration and vital statistics. In addition, the Service collects and publishes the vital statistics of the United States and maintains the standards for birth and death registration areas.

Cooperation between the Service and State agencies, which have the primary responsibility for collecting and processing vital records in their areas, is the key to success in this field. This voluntary collaboration has extended over a period of more than 40 years.

Steps were taken during the year 1950 to improve communicable disease reporting and morbidity statistics to provide data needed for health program planning, evaluation, and research. Wide variations exist in the reporting of communicable diseases and there are serious

gaps in available morbidity data. A committee on communicable disease reports was established to determine the needs for morbidity reports, the reporting procedures now used, and a minimum list of reportable diseases. The standards and procedures developed will be submitted to State health departments, the Public Health Conference on Records and Statistics, and an appropriate committee of the American Public Health Association. After clearances by these groups, the revised statement will be submitted for approval to the Association of State and Territorial Health Officers and to the American Public Health Association.

During the year, improvements were made in the content and format of regular morbidity reports. The "Health Officers' Weekly Statement" was expanded and renamed the "Weekly Morbidity Report"; and the "Communicable Disease Summary" is a one-page, current weekly report on the national picture of communicable diseases issued as a news release.

MORTALITY AND COMMUNICABLE DISEASES

Health conditions in 1949 were generally favorable. Even deaths from the chronic diseases, which have been mounting with the general aging of the population, showed little change from 1948. In 1949, the estimated crude death rate was 9.7 per 1,000 population. This is the lowest rate ever recorded for the nation. There were an estimated 1,446,000 deaths registered in 1949, an increase over the final number of 1,444,337 for 1948.

More children were born in the United States in 1949 than in any previous year except 1947. At the same time, the infant and maternal mortality rates declined to the lowest points recorded since the establishment of the birth-registration area in 1915. In 1915 the infant mortality rate was 100 per 1,000 live births. Since then it has dropped almost continuously to a rate of 31 per 1,000 live births in 1949. The maternal mortality rate has declined steadily since 1936, when it was 57 per 10,000 live births, to nine per 10,000 live births in 1949.

In 1949 the crude death rates for diseases of the heart and for malignant neoplasms were 351.5 and 137.6 per 100,000, respectively. These two causes of death together accounted for half the deaths in 1949. The

death rates for these two causes are now 20 and 15 percent higher, respectively, than they were in 1940.

A new procedure for the classification of the causes of death was adopted by international agreement and applied for the first time in the United States in 1949. When more than one cause of death is reported on a death certificate, the physician's choice is now accepted in selecting the underlying cause of death. This change in procedure will be reflected in mortality rates for conditions such as diabetes, nephritis, and syphilis, which often contribute to death without being the basic cause.

New lows of disease incidence for diphtheria, malaria, scarlet fever, endemic typhus fever, and whooping cough were recorded in 1949. The number of smallpox cases remained about the same. On the other hand, a new high was reported for acute poliomyelitis.

Provisional figures for reported cases of poliomyelitis for the calendar year 1949 were the highest on record—42,173 cases. The incidence rate per 100,000 estimated midyear population was 28.4. Records for 1950 indicate that reported cases of acute poliomyelitis are somewhat lower this year than they were for the corresponding period in 1949. Beginning with the low point in the "disease year" through December 2, 1950, a total of 30,858 cases of poliomyelitis were reported as compared with 40,529 for the corresponding period in 1949.

BIRTHS

The 1949 crude birth rate was estimated at 24.1 per 1,000 population, excluding the Armed Forces overseas, as compared to the final rate of 24.2 for 1948.

Taking into account unregistered births, it is estimated that 3,729,000 children were born in this country during 1949. The total number of children born in the four post-war years, 1946 through 1949, was close to 15,000,000. This was virtually the same as the number of children born in the five preceding years.

In 1935, 36.9 percent of the number of births occurred in hospitals. In 1948, 3,025,206 or 85.6 percent of all registered live births, occurred in hospitals or institutions. Close to 95 percent of all registered live births were attended by physicians in or out of hospitals during 1948. The comparable proportion in 1935 was about 88 percent.

EDUCATION FOR HEALTH

Good health, in its deepest sense, is the result of a partnership between the individual and the community in which he lives. Most people will support essential health services and practice desirable habits of personal hygiene to the extent that they understand basic health principles. The process by which people acquire the knowledge and gain the understanding is called health education.

Helping States and localities to reach the people with essential health information is the primary function in this field. Voluntary health agencies are assisted to expand their educational programs and to make their educational material more effective.

During 1950, either upon request or through program reviews, assistance was given to 28 States to strengthen their programs in health education. As one immediate result, six States worked out better methods for reaching people living in rural areas and intensified their health council activities.

The Public Health Service worked to improve school health programs, both through participation in health instruction for teachers and through help in the conduct of school health services. The Service participated in training activities for teachers in five States, gave lectures in the schools of public health which train educators, advised on health education curricula in five universities, and assisted in developing standards for the preparation of health educators.

PUBLIC HEALTH NURSING

Public health requires the active collaboration of many different kinds of health workers. Among the most important of these is the public health nurse. She is the member of the team directly responsible for seeing that those in need of medical care and advice get it. Through clinical services and home calls, she acts as the intermediary between the health department and the general public, and she may, in areas where doctors are few, be the only one to whom the ailing can turn for aid and care.

The Service aids the States and localities in improving the quality of their public health nursing services. An annual census of public

(Harris & Ewing, Washington, D. C.)

Miss Lucile Petry, the first Chief Nurse Officer with rank of Assistant Surgeon General.

(From USPHS Records)

Mobile dental trailer for providing dental care to Coast Guardsmen at isolated lifesaving stations and lighthouses.

health nurses, which gives many agencies the information to plan their nursing programs and note their personnel weaknesses, is also compiled.

There are still far from enough nurses engaged in public health work to meet the need. It is encouraging, however, to see that their number is steadily increasing. On January 1, 1950, there were more than 25,000 nurses employed in public health work in this country, an increase of almost 2,000 over the preceding year's figure.

There are several factors that tend to limit the available supply of public health nurses. Although there are more active graduate nurses in the United States now than ever before, the demand for their services in hospitals, industries, and private physicians' offices has grown disproportionately to the supply. Moreover, the salaries paid in public health work are not high enough to attract the nursing school graduate, particularly in view of the additional training that is usually required. Few nursing schools stress the preventive approach to health programs, and the young graduate is likely to know little or nothing about public health. The universities which do offer training in public health nursing must limit their enrollment because of the lack of facilities available for practice in field agencies with competent supervision.

Leadership and guidance in the development of public health nursing throughout the country are provided in several ways by the Service. It furnishes direct consultation services to health and nursing administrators, supplies leadership for the profession by active participation in the work of health and nursing organizations, and directs or aids in surveys of public health nursing needs and problems. Nurses from the Service also assist State and local health agencies in establishing or improving their nursing programs.

The National Institutes of Health

The National Institutes of Health have primary responsibility for basic as contrasted with applied research within the Public Health Service. They conduct and foster studies into the causes, prevention, diagnosis, and treatment of diseases. They conduct a disciplined search for more medical and scientific knowledge, with increasing emphasis in

recent years upon the chronic diseases which are now the greatest causes of disability and death in our population. The laboratory work which has been an important constituent of Service research will be supplemented by clinical research in the new Clinical Center of the National Institutes of Health, more than 30 percent completed at the end of 1950. Close cooperative relationships are maintained with research interests outside the Service, both by exchange of knowledge among scientists and by certain systematic liaison devices (National Advisory Councils, study sections, and cooperative programs with non-Federal agencies).

The National Institutes of Health administer the extensive Public Health Service grants and fellowships program in support of research—assisting in the financing of specific research projects, providing funds for the specialized training of promising young scientists, aiding in the construction of research facilities, and furthering the expansion of teaching programs in medical schools and in colleges. Of great importance, too, is the establishment of facilities and programs for clinical investigation.

In 1950, approximately 900 professional and scientific personnel, supported by essential administrative, maintenance, and service personnel, conducted a broad intramural program within the framework of seven Institutes covering all of the major scientific disciplines and nearly all fields of medical research.

COMPONENT INSTITUTES

The National Microbiological Institute was established by administrative action in 1948 through a combination and reorganization of existing basic research units of the Public Health Service; and six categorical institutes (National Cancer Institute in 1937; National Heart Institute in 1948; National Institute of Dental Research in 1948; National Institute of Mental Health in 1949, from the former Mental Hygiene Division of the Bureau of Medical Services; National Institute of Arthritis and Metabolic Diseases in 1950; and National Institute of Neurological Diseases and Blindness in 1950) have been established for investigations into specific diseases which are of major importance to health.

THE CLINICAL CENTER

By the close of 1950, the Clinical Center of the National Institutes of Health in Bethesda, Maryland, has risen to the fifth of its 14 stories. One of its auxiliary structures, the Isotope Laboratory, was completed and in operation; and another, the Utility Building, neared completion. The Research Facilities Planning Committee and its subcommittees continued to advise the Director of the Clinical Center and his staff on all phases of construction and equipment for both laboratory research and clinical investigation.

The Clinical Center, representing the culmination of almost a decade of planning for the improvement and expansion of the intramural research program of the Public Health Service, will constitute a medical research facility for the use of all the Institutes now comprising the National Institutes of Health. It should be, therefore, an important asset in this country's attack on such chronic diseases as cancer, mental illnesses, heart diseases, arthritis, metabolic disorders, neurological diseases and blindness, as well as on many of the infectious diseases which have so far resisted control.

Designed to provide facilities for an integrated program of laboratory research and clinical investigation, the Clinical Center will be a 14-story building with space for 500 beds, over 1,000 laboratory modules, and central services. Nearby will be a group of auxiliary structures providing power, incineration, storage, laundry, animal breeding, and maintenance and fabrication shops.

Both the design for the physical plant and program planning for the Clinical Center have been based upon three principal objectives: (1) flexibility to meet changes constantly taking place in medical problems, hospital administrative practice, and standards of patient care; (2) continuing mutual stimulation between scientists engaged in basic laboratory research and clinicians active in clinical investigations, as they focus on common problems; and (3) a multi-disciplinary approach to the complex problems presented by chronic diseases, through the effective integration of the contributions of many scientific disciplines. To these fundamental objectives might be added another continuing and fundamental one for any research organization—the creation of an

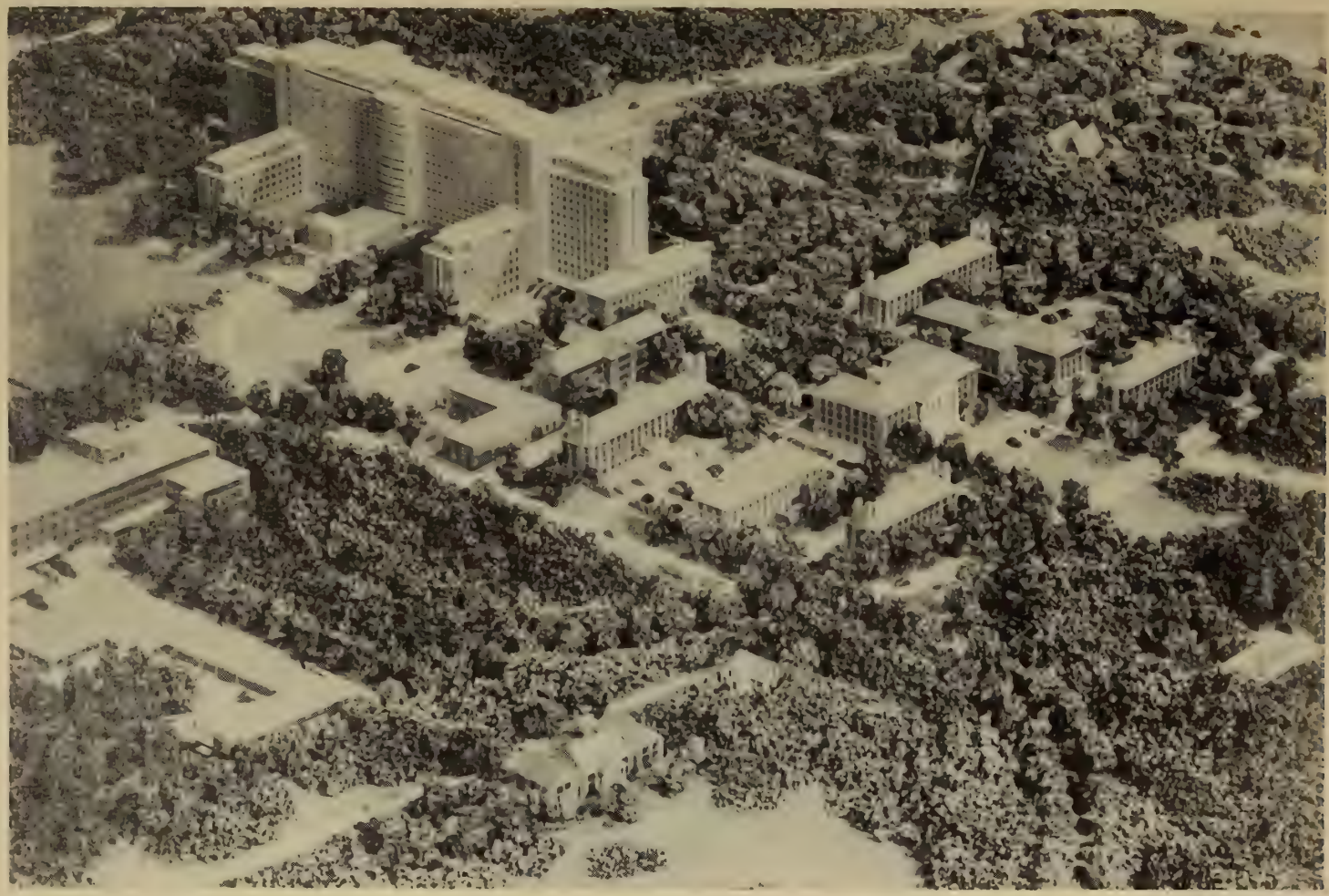
atmosphere which will foster the true scientific spirit of inquiry and which will result in the most productive use of time, men, and materials.

The laboratory areas of the Clinical Center, occupying two-thirds of the building, have been planned with a view to achieving maximum flexibility to meet the ever-changing demands of research programs. The utmost in adaptability has been sought through grouping of utility service line outlets at regular intervals, installation of demountable partitions, and standardization of laboratory benches, furniture, and equipment.

The proximity of research laboratories to patient care areas creates special problems in relation to protection against a variety of hazards arising from the use of large numbers of animals and the handling of pathogenic, toxic, inflammable, corrosive, and radioactive materials. Continuing study by engineers and other specialists is occupying the attention of the staff of the Research Facilities Planning Branch. Particular attention is being given to problems of ventilation in a completely air-conditioned building, through development of new designs for chemical fume hoods. Protective measures against local atmospheric and water pollution, as a result of augmented research activities, are being carefully planned as a part of a broad approach to environmental safety. New problems of protection of personnel and in disposal of radioactive wastes are also being studied as the National Institutes of Health undertake radiation research.

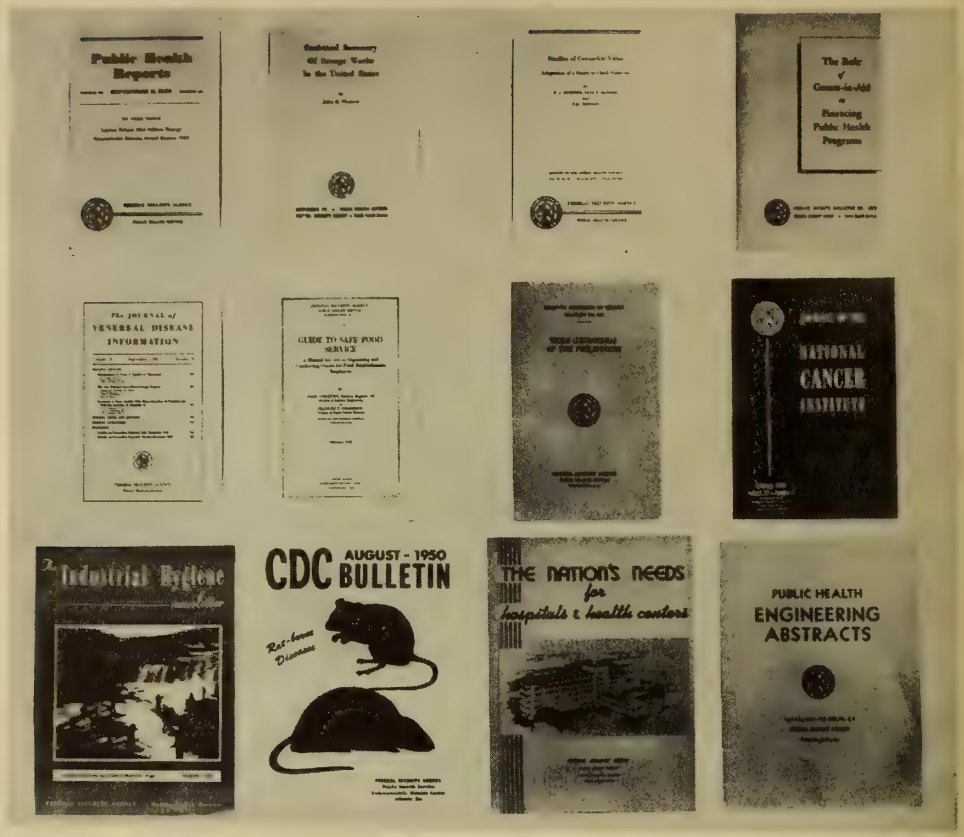
For patients undergoing study in the Clinical Center, medical diagnosis and treatment of the highest quality will be provided—treatment which will include a wide range of adjunct services now considered essential to modern medical treatment. The goal will be to bring the best that modern medicine and its ancillary services have to offer to the rehabilitation of each patient. Already a great deal of attention is being given to ways in which effective clinical teamwork can be achieved in the care of patients.

The Clinical Center will draw patients from all over the country. Referral by a physician, hospital, or health agency will be required. The basis for selection will be a confirmed diagnosis that the patient is suffering from a disease that is currently under study in the Clinical Center.



(From USPHS Records)

Model showing completion of current Clinical Center building program at the National Institutes of Health. Construction is expected to be completed by 1952.


Public Health Reports
The Role of Grants-in-Aid in Financing Public Health Programs
The JOURNAL of VENEREAL DISEASE INFORMATION
GUIDE TO SAFE FOOD SERVICE
NATIONAL CANCER INSTITUTE
The Industrial Hygiene
CDC AUGUST - 1950 BULLETIN
Rat-borne Diseases
THE NATION'S NEEDS for hospitals & health centers
PUBLIC HEALTH ENGINEERING ABSTRACTS

(From USPHS Records)

Specimen cover pages of Service publications issued during 1950.

From the standpoint of age, race, residence, financial status, personality, kind and degree of disability, and the nature and amount of care required, a wide variation in the patient group is expected. Because of the serious nature of the diseases which will be studied and the long periods of meticulous observation required in many research projects, relatively long periods of hospitalization are anticipated. Then, too, most studies will require medical supervision and follow-up for many years.

Every effort will be made to maintain cooperative relationships between the Clinical Center and referring physicians, hospitals, and health agencies. Particular attention will be devoted to keeping the patient's own physician informed of his progress and results of treatment. In addition, special cooperative relationships with teaching hospitals will be developed for the referral of patients suitable for study, and in relation to plans for their care following discharge from the Clinical Center. The resources of the patient's home community will, of course, be utilized in planning for post-discharge care and for services to his family during hospitalization.

NATIONAL MICROBIOLOGICAL INSTITUTE

The advancement of knowledge of the cause, diagnosis, treatment, and prevention of disease through study of its fundamental processes is the principal objective of this Institute. Its laboratories of Biochemistry, Nutrition, Pathology and Pharmacology, Chemistry and Chemotherapy, and Physical Biology are engaged in basic medical research; and their specialized equipment and staffs are readily available to other investigators throughout the National Institutes of Health.

Among the more important research accomplishments during 1950 has been the discovery of a new series of pain-relieving drugs which offer considerable promise as substitutes for morphine, of potential value in relief of drug addiction. In another field a new method by which histamine (thought to be involved in producing allergic reactions such as asthma, hay fever, and hives) is detoxified in the body has been under investigation. Findings point to new knowledge of how the body handles histamines and new ways to control the metabolism of it in the body.

In collaboration with the Department of Agriculture, an expedition was sent to Africa to collect seeds and plant material of several species of *strophanthus,* reported to be a potential source of cortisone. Although preliminary results indicate no reason to believe that the *strophanthus* materials will be a practical source of cortisone, the search for a suitable plant source will be continued in other areas.

In the field of nutrition, evidence was obtained indicating the existence of several new growth and antigrowth factors. Efforts are now being made to identify all of these factors. In studies related to peptic ulcers, it has been found that pyridoxine deficiency (vitamin B_6) reduces gastric secretion, and that rats receiving a purified diet show a marked decrease in gastric secretion with age when compared with rats receiving diets containing natural products. This investigation is in the direction of determining what substances in food and what properties of food will prevent ulcer formation.

Although it is well known that insulin will control diabetes, the causes of diabetes are not yet known. Studies have shown that diabetes in animals is not entirely a deficiency of insulin by indicating (a) that diabetes can be produced by using an excess of certain pituitary hormones, either the growth hormones or ACTH (Adren-Cortico-Trophic-Hormone), and (b) that the nervous system has a profound influence on the ability of an animal to utilize sugar, a factor important in diabetes.

With the opening of the new Isotope Laboratory, a monitoring system for protecting the entire staff of the National Institutes of Health was put into effect, thus insuring both the safety and the accuracy of investigations into the biological effects of high and low energy radiation.

Research into drinking large amounts of salty water as an emergency treatment for surgical and burn shock was completed in the laboratory with conclusive evidence that extensive clinical trials of these findings are warranted. Steps in this direction within the Service (through the Marine Hospitals) and through grants-in-aid programs have been initiated.

COMMUNICABLE DISEASES

Research in the communicable diseases, to guard against the recurrence of known diseases or to study the epidemiology and prevent the

spread of those identified, is carried out in four laboratories which have been in existence in varying forms for many years, going back to the beginning of the twentieth century, with a record of notable achievements in the prevention and reduction of epidemics and deaths due to communicable diseases in this country. The Laboratory of Infectious Diseases, the Laboratory of Tropical Diseases, the Biologics Control Laboratory, and the Rocky Mountain Laboratory in Hamilton, Montana, while concentrating on specific disease groups, also conduct basic research of direct value to research being conducted elsewhere.

Among the more important research accomplishments for the fiscal year 1950 is the finding that aureomycin is the first drug or antibiotic having specific therapeutic effect on whooping cough. The effectiveness of this drug given by mouth makes possible its practical home use; through such early treatment, the period of communicability can be shortened and the likelihood of spread lessened.

A standardized test procedure has been developed for brucellosis (undulant fever) significant in comparing the effectiveness of various therapeutic agents. To date, a combination of streptomycin and aureomycin has proved to be the most effective treatment for this disease. In the same field, major advances have been made toward developing an effective immunization against brucella infections through research on guinea pigs, pointing the way toward enhancing the immunogenic potency of various antigens.

It has been found that inhalation of *Coxiella burnetii* (the causative agent of Q fever) by cattle can cause infections in the blood stream and in the placenta. This knowledge broadens the basis for epidemiological understanding of Q fever in cattle and its possible transmission in nature and indicates that there may be further relationships between the epidemiology of Q fever and brucellosis.

The need for more knowledge on immunological groups of influenza virus and their relationships was demonstrated by finding commercial vaccines ineffective against two groups of influenza virus. Control of epidemics is limited until such knowledge is available.

Ultraviolet radiation was proved ineffective against spirochetes in whole blood; although effective in the case of plasma, it is not possible

by use of ultraviolet radiation to destroy spirochetes in freshly drawn blood from infectious syphilitic donors.

In the future control of schistosomiasis (a disease occurring principally in foreign tropical areas, with snails as the intermediate host), field trials proved the effectiveness of six compounds that will kill the snails native to the United States and elsewhere which might be intermediate hosts to this disease.

NATIONAL CANCER INSTITUTE

The work of the National Cancer Institute is divided into three main categories; cancer research, cancer research grants and fellowships, and cancer control.

Research work in the Institute's own laboratories is organized in sections of biology, biophysics, chemotherapy, endocrinology, biochemistry, pathology, and epidemiology. Additional studies are carried on in two clinical research units in Baltimore, Maryland, and Washington, D. C., a laboratory of experimental oncology in San Francisco, California, and a laboratory in Washington, D. C., devoted to studies of physical and chemical environmental factors that are known to cause, or are suspected of causing, cancer in man.

The research program includes studies to determine the role of individual endocrine glands in the development or control of cancer; the effects of the use of hormones and antibiotics in cancer therapy; the nature and transmission of viruses known to be involved in the occurrence of tumors in experimental animals; the mechanism of carcinogenesis; the carcinogenicity of physical and chemical agents; the role of genetic factors in cancer; changes occurring in tissue as the result of radiation; the effects of whole body radiation; the chemical activity of cellular components; structural features of cells; studies of methods of producing cancers in specific organs of experimental animals; of the growth in vitro of cancer tissue from various body organs; of metabolism of biochemical derivatives of normal and cancer cells, including studies of cellular metabolism in which stable isotopes are used; studies of cell differentiations; studies of radioactive compounds; testing of chemicals for their ability to damage tumors; biochemical and pharmacological

study of the activity of selected compounds and their cytological effect on tumor cells; and the synthesis of new chemicals.

Studies at the Laboratory of Experimental Oncology in San Francisco include: (1) experimental therapy; (2) physiology, particularly cardiovascular and respiratory physiology of patients with neoplastic diseases; (3) biochemistry, including metabolic studies on cancer patients, and investigations of specific biochemical reactions; and (4) the study of protein fractions of cancer and normal tissues of human and experimental animal origin, utilizing physiochemical and immunochemical techniques.

Epidemiology studies are concerned largely with developing improved methods of analyzing epidemiological data in case histories already collected. Major emphasis is placed on the study of cases of cancer of the breast, cervix, and lung.

The research grants and fellowships program expands the cancer research facilities, increases the number of scientists trained in cancer research, and supports cancer research in outside institutions.

In 1950, 30 grants totaling $6,000,000 were recommended for construction projects, and 354 grants totaling $3,330,000 were recommended for research projects. The construction grants went to 28 institutions in 18 States and the District of Columbia; research grants to 117 institutions in 33 States, the District of Columbia, and six foreign countries.

One hundred and thirty-nine cancer research fellowships were recommended.

The research grants and fellowships branch also provides consultation services to individual cancer investigators and to institutions to assist them in planning research projects, to put them in touch with investigators working on related projects, to advise on construction of research facilities, and to help them in securing adequate personnel and equipment.

Advice is given and active participation taken in the planning and holding of meetings for the exchange of knowledge about progress in cancer research.

The cancer control program is directed at bringing about a wider application of present knowledge of the control of cancer, gaining new

knowledge in this field, and improving and expanding cancer facilities and services. The chief activities in the fiscal year 1950 were:

1. Aid to the official cancer control programs of the States, Territories, and Possessions through the allotment of $3,500,000 on a formula basis.

2. Sixty-four grants to support special cancer control projects, such as studies of epidemiologic and environmental cancer; evaluation of cancer diagnostic tests; cancer morbidity surveys; tumor registries; case-finding services; training in exfoliative cytology; production of educational films and other visual aids for professional personnel and the general public; special educational courses for physicians, nurses, and public health workers.

3. Grants of nearly $1,800,000 to medical schools and $182,000 to dental schools to improve their cancer teaching programs.

4. Support of postgraduate training of physicians in the diagnosis and treatment of cancer through clinical traineeships, of which 86 new ones were granted during the year and 32 were extended for an additional year.

5. The loan of radium to hospitals. Fifty-four institutions throughout the country had loans at the close of the fiscal year.

6. Education in cancer nursing through institutes, teaching of credit courses in universities, consultation services, provision of nursing personnel to assist in demonstration projects, participation in cancer nursing curriculum development for schools of nursing, the writing of a cancer nursing manual for public health nurses, special studies of public health nursing activities, and the development of various kinds of cancer nursing educational materials.

7. Studies of environmental cancer.

8. The conduct of cancer diagnostic test evaluation projects in cooperation with several universities.

9. Special studies of cytologic techniques and procedures, and cytologic studies directed toward determining the clinical significance of carcinoma in situ.

Through the Cancer Reports Section of the Office of Technical Services, the Institute also produces and distributes educational, teach-

ing, and informational materials for the use of professional and other groups.

NATIONAL HEART INSTITUTE

Steady progress was made during 1950 against America's leading cause of death, diseases of the heart and circulatory system. The National Heart Institute carried out programs aimed at the ultimate relief of suffering and death from heart diseases, and toward the discovery of new cures and preventive measures. The National Heart Institute provides leadership and coordination for the total Public Health Service heart program. Direct activities of the Institute are focused primarily on research and training, while control aspects of the program are administered by the Bureau of State Services. During 1950, activities in research, training, and control—three areas of chief importance to the conquest of heart disease—were markedly expanded as effective facets of the Public Health Service heart program. The heart disease problem is exceedingly complex, embracing more than 20 diseases of the heart and blood vessels. The greatest need at present is more knowledge of causes, additional methods of diagnosis and treatment, and new curative measures.

Among the accomplishments during 1950 has been the progress made toward devising an improved anticoagulant to prolong the clotting time of blood. Drugs now employed in routine treatment of heart disease to prevent the enlargement of existing blood clots or the formation of new ones have often exhibited capricious behavior when used clinically. Moreover, treatment with these agents at present requires hospitalization and rather expensive laboratory control. Studies have clarified the basic limitations of these drugs and are proceeding toward development of better agents.

A significant accomplishment during 1950 was the development of a powerful new drug, procaine amide, as an effective treatment for irregular heart beat or palpitation. The drug acts quickly and, more important, can be taken by mouth. Its use in suppressing irregular heart rhythms, which often cause cases of coronary thrombosis to have a fatal outcome, is expected to save many lives. This research accom-

plishment was made possible, in part, by the cooperation of a member of the pharmaceutical industry. The new drug is already available to physicians.

A revealing study of the epidemiology of heart diseases in an adult population in an average community progressed at Framingham, Massachusetts. Examination of the physical and cardiac status of approximately 2,250 persons provided some definite information as to what factors or characteristics are present in persons who develop heart disease.

Heart disease research throughout the nation was fostered and supported through research grants to 96 institutions in the United States and abroad, with 388 grants amounting to nearly $4,000,000, making possible the full use of non-governmental facilities and qualified personnel for important research projects. Promising investigations were conducted in all areas of heart disease, with concentration of support in studies of hypertension, arteriosclerosis, and heart failure. Illustrative of the progress being made are the studies dealing with hereditary and environmental factors relating to the development of cardiovascular disorders; investigation with regard to renal function; new surgical attacks on the problem of coronary heart disease; development of an artificial heart; evaluation of dietary factors in hypertension; and investigations with new drugs and hormonal substances, such as ACTH and cortisone, in rheumatic fever and rheumatic heart disease.

Giant lipo-protein molecules, present in normal blood but which, in increased amounts, appear to be definitely associated with atherosclerosis, chief form of arteriosclerosis, were discovered. This research is significant because of its potentialities for the development of simple and nonhazardous tests for early case finding in arteriosclerosis and for the development of preventive or curative treatments.

Grants totaling slightly more than $6,000,000 were made during 1950 to 26 institutions located in 17 States for construction of additional vitally needed research facilities.

As in other fields of medical science, there is a critical shortage of personnel trained in research and clinical aspects of the cardiovascular diseases. To help relieve this shortage and to promote use of the

latest methods of diagnosis and treatment, the National Heart Institute awarded 85 fellowships to some of the most brilliant and promising workers in medical science, gave traineeships to 51 physicians, and grants to 45 accredited medical schools to coordinate and improve their teaching of diseases of the cardiovascular system.

NATIONAL INSTITUTE OF DENTAL RESEARCH

Officially activated as part of the National Institutes of Health in September of 1948, the National Institute of Dental Research during its brief period of existence has devoted much of its efforts to investigation of the causes and control of the nation's most prevalent disease—dental caries. Here the emphasis is on the most basic problems underlying and contributing to pathologic conditions of the teeth and their supporting tissues.

Employing methods made possible by such instruments as the electron microscope and the electron diffraction apparatus, studies are well in progress on the ultimate structure and composition of the teeth and the influence on them of both normal and experimentally produced environments. In the field of oral bacteriology, advances have been made in the identification and physiology of the oral microflora, development of culture media for their isolation, and the role of antibiotics and other inhibitory agents in controlling their biochemical activities.

Contributions from many fields of science will be needed for adequate promotion of research in the dental field; hence grants are made to investigators working in such fields as bacteriology and pathology. In 1950 a total of $31,165 was awarded to 12 research fellows, eight of whom had degrees in dentistry and were studying for an advanced degree in a basic science. In the same period, 34 research grants totaling $200,324 were made in support of a wide variety of projects on dental problems.

Some of the findings which have been made by investigators supported in whole or in part through the grant-in-aid program are contributing significant data to the various fields of oral research. One grantee has shown that there is no apparent relationship between the fluoride content of saliva and either the oral lactobacilli count or the pre-

valence of dental caries. Another has demonstrated that the flattened bands of organic matter in the enamel of the teeth, called lamellae, are not developmental defects. Another has demonstrated statistically that the examination of the anterior segments alone for the occurrence of degree of gingivitis is a valid index of the gingivital experience of the entire mouth. In the study of the mechanism of enamel solubility with certain reagents containing both fluorine and no fluorine, stannous fluoride was shown to decrease the solubility of enamel, dentin, and tri-calcium phosphate to the greatest extent.

THE NATIONAL INSTITUTE OF MENTAL HEALTH

The National Institute of Mental Health is attacking the important health problem assigned to it through three principal programs: research, training of professional workers, and aid to State and local community programs.

Formerly the Division of Mental Hygiene in the Bureau of Medical Services, this is the first full year that the Institute has operated as a unit of the National Institutes of Health, and the third year that grants have been awarded to States for mental health programs—to educational institutions for the training of mental health personnel, and to non-Federal research institutions and investigators for mental health research.

During 1950, 68 research projects were supported by National Institute of Mental Health research grants, totaling $800,000. Of this amount, 34 percent was devoted to basic research in child personality and development, experimental psychology, and experimental neurology; 31 percent went for studies of specific mental or neurological disorders, such as child behavior and psychosomatic disorders; 19 percent was devoted to the evaluation of lobotomy, psychotherapy, and other treatment methods; and the remainder aided studies in diagnostic and preventive techniques and the sociology and epidemiology of mental disorder. An additional $100,000 went for research fellowships. Research was also conducted by National Institute of Mental Health staff on epilepsy, multiple sclerosis, drug addiction, and community mental health problems.

To help expand teaching programs in mental health fields, more than $2,500,000 was allocated for aid to teaching centers in 1950. Almost $1,000,000 was awarded in stipends to graduate students taking advanced work in psychiatry, psychiatric nursing, psychiatric social work, and clinical psychology.

Since the start of the national mental health program, almost $10,000,000 has been appropriated to aid State and local programs. Over half of these funds was used for community clinical services. As a result of this aid, 106 new clinics were started and 186 clinics were able to expand their services. All 53 States, Territories and Possessions now have active mental health programs; fewer than half had such programs before 1947.

Mental health needs were explored in such areas as education, children's services, vocational rehabilitation, alcoholism, and aging.

Mental hospitals in nine States were surveyed, and the findings contributed to improvements in several State institutions. An advisory panel was organized to plan for production of current and more meaningful data on all aspects of the mental health program. A report on the patients in State mental hospitals in 1948 indicates that these hospitals care for about 95 percent of the resident patient population in all non-Federal public hospitals for the mentally ill. The average daily resident population in these institutions in 1948 was 463,496, or slightly more than three patients per 1,000 population. Schizophrenia, cerebral arteriosclerosis, and senility accounted for the largest number of first admissions.

RESEARCH GRANTS AND FELLOWSHIPS

The purpose of the Public Health Service Research Grants Program is to support research in medical and allied fields for which funds are inadequate or which could not otherwise be conducted in the grantee institution. The major objectives of the grants program are: (1) to expand research activities in universities and other institutions; (2) to stimulate the initiation of research in small colleges where previous research programs have been very limited or nonexistent; (3) to encourage investigators to undertake research in neglected scientific areas;

and (4) to provide training for scientific personnel. In carrying out these objectives, the aim of the Public Health Service is to promote the highest quality of endeavors in both fundamental and applied research and render assistance to public authorities, scientific institutions, and scientists in these endeavors.

During 1950 a total of 712 applications for research grants in the noncategorical fields were approved for payment in the amount of $5,917,156, which when added to those research grants made in the heart, cancer, dental, and mental health categorical fields, made a total of 1,528 grants in the total amount of $13,599,951. For the first time since the Research Grants Program was established, all five of the National Advisory Councils met together to discuss the development of long-range programs for the advancement of the medical and allied research fields, as well as policy questions requiring uniform action by all Councils. The vast volume of requests for research grant funds has required the establishment of a priority system for determining payment of the grant. This priority system is established in order to permit all new applicants to compete for funds on an equal basis, and to insure a quicker response and action on the applicants' requests. Since this priority scheme covers future years of commitment as well as the current year, it provides assurance to grantees in the form of a moral commitment that such funds will be provided as long as appropriations are available.

Study Sections of Special Consultants, expert in the various fields of research, provide technical review and advice on all applications for research grants received. In addition to this review, these scientific leaders survey the status of research in their respective fields to determine those areas where stimulation should be afforded to provide initiation of additional research needed. These Sections are set up largely along lines of the several disciplines, as for example, biochemistry, pathology, physiology, and pharmacology; on the other hand, whenever the volume of applications or special needs have arisen, special Study Sections have been established to provide for the situation presented, as for example, the Tuberculosis Study Section which was needed for a period of two years when streptomycin increased applications for research in

this field tenfold. This sort of flexibility in operation of the program has permitted adequate review and recommendations to the Surgeon General on all project proposals, and on larger programs such as that presented with the rapid expansion of work with hormones as the result of the impact on this field of cortisone and ACTH.

During 1950, the rate of receipt of applications for research fellowships continued to increase, showing a total of 1,204 as compared with 665 applications received in 1949. Since appropriations did not correspondingly increase, only 427 fellowships were awarded in 1950, as contrasted with 392 fellowships awarded in 1949. At the present time (1950), there are 474 Fellows receiving support from the National Institutes of Health. They are located in 30 cities, the District of Columbia, and five foreign countries. The Boards charged with the responsibility for reviewing applications for research fellowships have unanimously agreed that the caliber of the applicants has improved parallel with the increase in the total applications received during this year.

Office of the Surgeon General

PUBLIC HEALTH METHODS

Research which will provide quantitative evaluation of the health needs and resources of the population and of the effectiveness of survey, diagnostic, and clinical techniques is important in planning for public health. Information is also necessary relating to policies, proposals, and existing programs for the training, distribution, and use of health personnel, facilities and services. These responsibilities involve continuing and detailed analyses of administrative and financial aspects of legislative proposals for health programs and study of available data on expenditures for medical and other health services in relation to total family expenditures and per capita income.

HEALTH MANPOWER AND EDUCATION FOR THE HEALTH PROFESSIONS

For many years problems of supply and distribution of persons in the United States to maintain the needed ratios of health personnel to

population and to staff the Federal, State and local agencies providing health services have been a matter of interest. These problems are of especial importance when, in 1950, the prospects of an expanding strength of the Armed Forces indicate that large numbers of physicians, dentists, nurses, and medical and hospital technicians may be withdrawn from civilian occupations.

CIVILIAN HEALTH MANPOWER REQUIREMENTS IN TIME OF EMERGENCY

In response to a request from the National Security Resources Board, preliminary estimates have been made of the minimum number of physicians, dentists, registered professional nurses, sanitary engineers, pharmacists, and veterinarians required for civilian health as compared with the number of active personnel available in these categories. A Public Health Service Committee on Emergency Civilian Needs for Personnel and Facilities keeps in close touch with professional organizations and other sources of information on the available supply of personnel and with the requirements of the Armed Forces and other Federal agencies. Studies of experience in the United States and in other countries during World War II are in process, as well as studies of the distribution and utilization of existing health personnel and facilities.

MEDICAL SCHOOLS AND MEDICAL SCHOOL FINANCES

A survey of medical schools of the United States, under the supervision of the Committee on Medical School Grants and Finances of the Public Health Service, was completed during 1950.

"Financial Status and Needs of Medical Schools—A Preliminary Report," comprises about 100 pages, including 67 tables. This report presents data on the background and characteristics of the schools, their expenses and income for basic operations and separately budgeted research, their basic operating expenses per student, the deficits and surpluses derived in reconciling operating expenses and income, comparisons of expenses and tuition income in 1940-41 and 1947-48, endowment funds and endowment income and changes in endowment from 1941 to 1948, staff vacancies, and the deans' estimates of current and prospective needs of the schools. The deans' opinions and comments summarized

in this report cite their staff needs, the curtailment in operations resulting from shortages of staff and funds, the estimated costs of necessary improvements in operations and plants to maintain standards with current enrollment, and the funds needed for operations and plant if the schools are to carry out their plans for increasing enrollment.

A report on the grants programs of the Public Health Service is being prepared. Special consideration is given to the present distribution of research grants for cancer, heart disease, mental health, to medical schools analyzed in relation to the characteristics of the schools in terms of size, public or private control, expenses, and full-time faculty. Opinions of the deans on the effect of grants on their research and training programs and on staff and other resources are summarized. The deans' suggestions for improvement of the programs are noted in a section on problems of administrative policies and procedures.

SURVEY OF TRAINING FACILITIES FOR PUBLIC HEALTH WORKERS

Expanded and expanding activities in the field of public health call for increasing numbers of trained personnel to serve in administrative and technical positions in public health agencies; in voluntary health organizations; in health programs of schools, industrial establishments, and labor organizations; in sanitary engineering; and in teaching and research. Plans include accumulation of existing information on the supply of trained public health workers in relation to the demand for their services and on the facilities and output of the institutions that train these workers.

INTERNATIONAL HEALTH

The Economic Cooperation Administration (ECA) during 1950 began sponsoring emergency assistance programs in Southeast Asia and other areas. Disease control is assigned a key role under these programs.

Under both the long-range Point Four Program and the immediate ECA programs the Public Health Service was made responsible for the staffing and direction of teams of experts to carry out needed health projects. The Public Health Service has prepared to meet its urgent responsibilities under these programs. Disease problems in the underdeveloped areas have been studied. Other government agencies have

been consulted to develop a coordinated and balanced program. The Surgeon General has given priority to the needs of overseas programs for expert health personnel. Lists of health specialists qualified for overseas assignments have been tentatively developed. The strategy of attacking specific diseases in affected areas has been mapped out. Dr. Howard M. Kline of the Public Health Service completed a 10-week on-the-spot survey of health conditions in the Near East and Southeast Asia. The experience of technical missions already in the field has been drawn upon.

CURRENT FOREIGN MISSIONS

Greek Mission—The Public Health Division of the ECA Mission to Greece was established in 1947. Its three-year program provides many impressive illustrations of the effectiveness of a planned attack on disease as a major weapon in economic development. Before the war, more than 2,000,000 Greek men, women, and children became ill from malaria each year. The Mission now reports that the number of cases has been cut below 50,000. This is a reduction of almost 98 percent. The Mission reported in June 1950: "Malaria has been conquered as a major health problem in Greece."

In the fight against tuberculosis, more than 1,000 beds for tuberculous patients have been added to Greek hospital facilities; a 200-bed sanatorium is being constructed; over 800,000 children have been tuberculin tested and 500,000 vaccinated against tuberculosis; and 500,000 people have been given chest X-ray examinations.

Four new Greek hospitals are being built. Fifty hospitals are being repaired. Under the supervision of four American nurses, more than 1,000 Greek practical nurses have been given six to eight weeks' training courses to aid them in caring for the sick. Fourteen Greek physicians and nurses have been sent to the United States and other countries for advanced study.

Progress has been made in improving sanitation. Over 5,000 tons of pipe have been delivered. Water supply projects have been started in more than 100 places.

Sixteen Service officers are serving with the Public Health Division staff in Greece, including five physicians, four nurses, and five sanitary engineers.

Liberian Mission—The pioneer work of the United States Public Health Service Mission to Liberia, established in 1944, has provided a valuable guide in planning health projects in other underdeveloped areas. The Mission has carried on an intensive malaria control program in the Monrovia area. Mosquitoes have been attacked with DDT. Tests of chloroquine, an antimalarial drug, have also been conducted. The Mission has completed intensive surveys of the diseases handicapping the Liberian people. The chief of the Mission has traveled over most of the country's 43,000 square miles by jeep and on foot, surveying disease problems. The Mission operates a model clinic in Monrovia, where 24,000 patients were treated last year. The new building for the nurses' training school is almost completed. Twenty nurses were graduated during the year. Thirteen Liberians are also being given special laboratory training in tropical diseases. The expenditures of the Liberian government for health have increased fivefold since the establishment of the Public Health Service Mission. This illustrates the way in which health aid projects may inspire increased efforts by local people to improve conditions.

Indo-China Mission—Early in July 1950, five Public Health Service officers flew to Saigon, Indo-China, to assist local health experts in carrying out a rapid campaign against malaria and other serious diseases. They were assigned to the Health Division of the special ECA Mission to the Associated States of Indo-China (Vietnam, Laos, and Cambodia). Supplies of DDT, chloroquine, penicillin, and various drugs to treat intestinal infections are being shipped to Indo-China to aid in the program. The team was the first of a larger group to be assigned later as part of the United States program of special assistance in Southeast Asia.

TRAINING PROGRAM

Many countries desperately need well-trained physicians and nurses to care for the sick and to prevent disease. In 1950, the efforts of individual governments and the World Health Organization to meet this need were accelerated. Many of these foreign health trainees came to the United States to pursue their advanced studies. The Public Health Service arranged programs and provided assistance to 385 such

trainees and visitors during the year. This is almost 100 more than the total assisted in the preceding year.

Schools and courses to meet the special needs of each trainee are selected. Special programs of field observations of State and local health units are arranged. Specialists are provided with opportunities to consult with United States experts in their fields. Staff members observe the work of trainees and arrange specialized programs. These study and observation programs range from a few months to one year, depending on the type of training which will be of greatest use to the trainee upon his return to his home country.

Study programs were arranged for 153 trainees who received fellowships under various United States grants or from other sources. These trainees came from Latin America (34), the Philippines (53), Greece (6), Western Germany (34), Japan (10), Austria (3), and other countries (13). Special programs were also arranged for 45 trainees from 17 countries whose governments had requested such assistance.

Programs were prepared for 52 World Health Organization Fellows who began studies in the United States. Nineteen American health experts desiring to make advanced studies abroad received WHO Fellowships. The WHO was assisted in making these awards by the Fellowship Selection Board set up by Surgeon General Scheele at the request of WHO.

THE WORLD HEALTH ORGANIZATION

The United States in 1950 continued to play an active part in the work of the World Health Organization, which it joined in 1948. The WHO has now completed its organization. It is working all over the world toward its goal of winning for all people the highest possible level of health. The WHO has taken vigorous steps toward worldwide campaigns against the "top priority" diseases: malaria, venereal disease, and tuberculosis. Regional offices have been set up to bring WHO services closer to the people. The aim of the WHO is to help the health departments of member nations do a better job—not to do their job for them. Therefore, every WHO project is conducted through the health department of the nation asking assistance.

The WHO carried out special projects in 76 countries and territories in the year. The projects ranged from demonstrations of malaria control in Southeast Asia to expert advice on refuse disposal and nutrition in the United States. Seven WHO experts completed a six weeks' inspection of United States facilities for treatment of venereal disease. Twenty-one American health specialists, including five Public Health Service officers, served on WHO expert committees.

Third World Health Assembly—Surgeon General Leonard A. Scheele served as chairman of the American delegation to the third World Health Assembly held in Geneva, Switzerland, from May 8-23, 1950. Other members of the American delegation were: Dr. Vlado A. Getting, Commissioner of Public Health of Massachusetts; Mrs. John L. Whitehurst, Chairman of the Council of International Clubs; Dr. H. van Zile Hyde of the Public Health Service, Director of the Division of Health and Sanitation, Institute of Inter-American Affairs; Howard B. Calderwood of the Department of State, and Dr. Edward J. McCormick, a member of the Board of Trustees of the American Medical Association. Seven advisers, including Congressman Walter H. Judd of Minnesota (a physician), accompanied the delegation.

The Assembly reduced the United States share of the budget from 36 percent to 35 percent in accord with a previous agreement that the United States share would be reduced gradually to no more than one-third. The 1949 Assembly had reduced the United States share from 38.54 percent to 36 percent. The budget for the calendar year 1951, based on the contributions of member nations, was set at $7,100,000. Funds from other sources make the total budget $7,300,000. The United States share of the budget for 1951 is $2, 481,159. This is about $39,000 less than the United States assessment for 1950. Legislation raising the ceiling on the United States contribution to the WHO to $3,000,000 a year was approved by Congress in July 1950. This action was necessary because of the ceiling of $1,920,000 which had previously been placed on the United States appropriation. The Fourth Assembly meets in Geneva in May 1951.

The Soviet Union, China, Albania, Bulgaria, Byelorussia, Czechoslovakia, the Ukraine, Hungary, and Rumania withdrew from the WHO

during the year. Their default on their contributions and the slow payments from a few other countries forced the WHO to reduce its planned operations and stay within a level of expenditures of $6,300,000 during 1950.

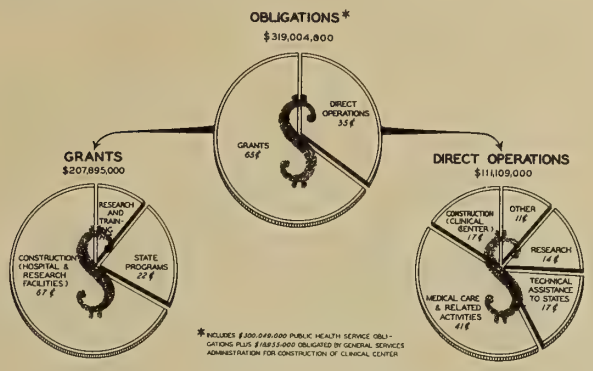
Dr. H. van Zile Hyde of the Public Health Service, the United States Representative on the Executive Board of the WHO, represented the WHO at the United Nations Technical Assistance Conference in June 1950 in New York City. Fifty governments, including the United States, pledged contributions at the Conference to the United Nations Technical Assistance Fund. The WHO will receive 22 percent of the first $10,000,000 of the United Nations Technical Assistance Fund and a slightly smaller percentage of the next $10,000,000. This fund will enable the WHO to expand considerably its field demonstration programs in underdeveloped areas.

Pan American Sanitary Bureau—In 1950, the Public Health Service continued its close cooperation with the Pan American Sanitary Bureau, now the Regional Office of the WHO for the Western Hemisphere. Under this cooperative arrangement, United States experts have been detailed on scores of assignments to other American Republics. Hundreds of Latin Americans have been given training in this country. An over-all survey of health services in six Latin American countries (Peru, Chile, Argentina, Uruguay, Brazil, and Puerto Rico) was made by Dr. H. van Zile Hyde in September 1949. Doctor Hyde was appointed Chief of the Division of Health and Sanitation of the Institute of Inter-American Affairs in February 1950.

Bureau of Medical Services

The work of this Bureau includes the provision of medical care for beneficiaries of the Service. The quarantine work and medical phases of immigration are important functions. Cooperating with State health departments or other special State agencies, the Bureau of Medical Services assists communities in planning, designing, constructing, and equipping local hospitals and related facilities. Aid is also rendered to other organizations in the development of medical, dental, nursing, and

HOW THE PUBLIC HEALTH SERVICE DOLLAR WAS SPENT IN FISCAL YEAR 1950



(From USPHS Records)

AVERAGE DAILY INPATIENT LOAD, BY BENEFICIARY

MARINE HOSPITALS, FISCAL YEAR 1950

Each figure represents 100 patients

(From USPHS Records)

(From USPHS Records)

U. S. Marine Hospital, Stapleton, Staten Island, New York.

(From USPHS Records)

U. S. Marine Hospital, New Orleans, Louisiana.

hospital services. Through this Bureau professional supervision is given officers of the Service assigned to other Federal agencies.

ADDICTION TO NARCOTIC DRUGS

The U. S. Public Health Service Hospitals at Lexington, Kentucky, and Fort Worth, Texas, are concerned with the physical and mental rehabilitation of persons addicted to narcotic drugs. Certain Government beneficiaries suffering from other mental illnesses also receive treatment. For 1950, these hospitals reported record population figures, reflecting increased voluntary admissions for treatment of drug addiction.

Worthy of note is the Addicts' Anonymous movement which originated in the Lexington hospital several years ago. Members hold regular meetings at the hospital and issue a monthly publication. Several chapters have been established by former patients in their home communities.

During the year 1950, 6,359 patients were admitted to the Lexington and Fort Worth hospitals, with an average daily admission rate of 17.4. The number of patients treated totaled 8,300.

PATIENTS WITH LEPROSY

The patients at the National Leprosarium, officially the U. S. Marine Hospital, Carville, Louisiana, need specialized care for leprosy as well as general hospital service. The same illnesses and injuries that befall the average citizen also occur among the men, women, and children at Carville. A group of consultants in such fields as physical medicine, orthopedics, and psychiatry strengthen the resident staff.

The results of treatment with the sulfone drugs continue encouraging. Over 50 percent of the patients at Carville are now running negative bacteriological tests. There is noticeable improvement in the condition of their skin lesions.

SERVICE HOSPITALS

During 1950, 71,636 patients were admitted to all the hospitals operated by the Public Health Service, an average of 196.3 per day. The average daily inpatient census for the fiscal year 1950 was 7,469.8. The number of visits to the outpatient stations totaled 1,021,935.

FEDERAL EMPLOYEE HEALTH PROGRAM

The Public Health Service provides professional and technical guidance to Federal agencies, upon request for a Federal employee health program, in the fields of preventive medicine and occupational health; and operates health programs for certain Federal agencies, by contract, on a reimbursable basis; and supervises the professional personnel of the health units of a few other Federal agencies.

The year 1950 was marked by a transition in emphasis from surveying the health needs of employees when requested by Federal agencies to increased emphasis on improving and enriching the quality of health services provided employees through the services of a consultative professional staff. Particular attention was given to improving procedures designed to provide more effective health services and to improving methods of operating health programs for Federal agencies.

HOSPITAL PLANNING AND CONSTRUCTION

The National Hospital Program, which provides Federal assistance to local communities for construction of hospitals and health centers, is administered by the Public Health Service.

The National Hospital Program has now (1950) been in operation for three years. It has brought about a comprehensive plan showing the location and size of hospital facilities which are needed in each State. For the first time a definite plan is being followed by each State in determining the location, size, and type of facility which can best meet the hospital and health center needs of the people. Hospital construction plans prepared by each State agency and approved by the U. S. Public Health Service have been extremely valuable in stimulating local communities to construct hospitals and health centers. In addition, the program has resulted in the enactment of hospital licensure laws in many States where none existed previously, The impact of the program on modern design and construction has been gratifying with respect not only to hospitals built under the program, but also to those built without Federal aid. Improved services to patients have likewise resulted from better planned and better designed hospitals.

A total of 65,000 hospital beds and 250 public health centers are being added to the nation's health plant by 1,300 projects approved as

of June 30, 1950. This represents an estimated total expenditure of nearly $1,000,000,000 toward which the Federal contribution will be about $345,000,000. Approximately 300 of these projects are already in operation and 500 of the remainder are under construction.

In general, hospitals are being built first where they are needed most, and usually these are also in areas of lowest income. General hospital projects predominate in the program. Eighty percent of the total beds added to date are in these facilities. About one-half of the general hospital projects are new facilities, nearly all of which are located in towns of less than 10,000 population. These are typically small hospitals of 50 beds or less.

Increasing attention is being given to other categories of hospital facilities, particularly tuberculosis, psychiatric and chronic units in general hospitals, and to public health centers. Four States (Georgia, Louisiana, Mississippi, and South Carolina) now have extensive programs for health centers, and other States are beginning to develop such programs.

The Hospital Survey and Construction Act was amended in October 1949 to authorize $150,000,000 to be appropriated for each fiscal year beginning with 1950, instead of $75,000,000 authorized by the original Act, and to provide a minimum allotment of $200,000 instead of $100,000 for each State. In addition, each State was given discretion in establishing the percentage of Federal participation in each project. A State may select a uniform percentage of Federal participation which is applicable to all projects in the State. The uniform percentage may not be less than 33-1/3 percent nor more than the allotment percentage or 66-2/3 percent, whichever is less. The allotment percentage is determined by a formula contained in the Act and is based on the per capita income of the State in relation to the national average per capita income. The State may adopt a second alternative providing a variable percentage of Federal participation based on the economic status and relative need for hospital facilities of the various areas. The limits for the variable Federal share are from 33-1/3 percent to 66-2/3 percent. Under this alternative a different Federal percentage of Federal participation is applicable to each project or class of projects within the State.

MEDICAL AND HOSPITAL RESOURCES

The scope of Public Health Service activities during the year 1950 has been broadened to cover many aspects of hospital and related services, facilities, and resources. In addition to continuing activities in connection with the Hospital Survey and Construction Program, it was a year of planning and preparation; a year when principles and procedures were established; a year of careful attention to the minute details of an entirely new approach to the provision of better care for patients.

Section 636 of Public Law 380 (81st Congress), enacted in 1949, amending the Hospital Facilities Construction Act, authorized two approaches to meeting problems in the hospital and related fields: One was for the Public Health Service to conduct research, experiments, and demonstrations relating to the effective development and utilization of hospital services, facilities, and resources; the second was to authorize grants to others for similar activities, including coordination.

The problems fall generally into three broad categories. The first is the need for published guides for measuring community hospital and health needs, and the economics of supplying those needs. The second relates to administrative and clinical services necessary for the care of patients. The third general area is that of regional coordination of hospital facilities, services, and resources.

In response to requests from various sources, Service personnel have conferred with State agencies, national and regional groups, schools, hospitals, and other planners. Approximately 25 formal papers have been presented and many more informal talks given. Personnel have assisted in special studies including the Marine Hospital at Staten Island; and a Lynchburg, Virginia, hospital; also a report on rural health cooperatives. Consultation was given to the American Hospital Association in the preparation of a handbook of accounting and a hospital housekeeping manual.

Service personnel also cooperated with the American Hospital Association in the conduct of an Institute on the "Opening of the New Hospital." This was an outgrowth of an earlier session conducted in Atlanta, Georgia, at the request of State agencies in that area. It was followed by seminars in Washington for Regional Medical Directors and

(Official Coast Guard Photo)

Dr. Paul M. Stewart, Chief Medical Officer, U. S. Coast Guard, since 1946.

(From USPHS Records)

Professional Staff, U. S. Public Health Service Hospital, Fort Worth Texas, 1950.

FIRST ROW (Left to right): Dr. Leonard J. Ganser, Abraham Wolfthal (Pharmacist), Drs. Jane Nash Clifton, Arthur G. Malucky, Eugene W. Green, Richard B. Holt (Medical Officer in Charge), G. Alice Boore (Director of Nurses), Drs. Gordon G. Braendle, Merland E. DeBolt. SECOND ROW: Dr. Cecil C. Chandler, Mary Clark, Catherine Thompson, Mary Hernan, Mary Jocelyn, Frances Wallace, Astrid Jackson, Antoinette Buza (Chief Dietitian) John G. Turner (Administrative Officer). THIRD ROW: Dr. Thomas H. Ainsworth, Rebecca Chavez, Pauline Dietz, Lenore Brannon (Occupational Therapist), Lois Soultania, Ina Wood, Martha Dickens, Margarette Haire, Myrna Riggs, Frances Lembach, Dr. Robert E. Westfall. FOURTH ROW: Dr. John C. Wrye, III, Dr. Francis Wickersham (Psychologist), James R. Bisbee (Psychiatric Social Worker), Arthur K. Berliner (Chief, Social Service), Dr. James M. Horner, Guy B. Spence (Clinical Administrative Officer), Martha Rhyner, Frances Smith, Marie Van Son, Sadie Rodman, Ima Haley, Belle Miller, Dr. Randolph P. Grimm, Dr. Randolph A. Frank.

in Dallas and San Francisco for regional and State personnel, new hospital administrators, and others.

Statistics of the hospital construction program are gathered and analyzed. About 1,500 copies of "The Nation's Needs for Hospitals and Health Centers" have been sent out in response to requests. Several additional reports, based on statistical analyses, were printed in the *Public Health Reports.* These were:

Tuberculosis Hospital Planning
Hospital Construction and High Priority Areas
Hospital Construction Under the Hill-Burton Program—An Analysis of the Type, Size and Location of Projects Being Built with Federal Aid

DENTAL RESOURCES

One of the most important factors in oral health for the nation is the availability of effective manpower. An attempt has been made during the year to point up the manpower situation from the standpoint of availability and effectiveness of dentists, dental hygienists, dental assistants, dental technicians, and other persons engaged in oral health activities. Efforts have been expended in gaining information on the needs for dental care among various population groups. In this respect, the collection of data has been continued on the needs of Public Health Service beneficiaries as well as the general population.

Early in 1950, in cooperation with the Council on Dental Education of the American Dental Association, and the American Association of Dental Schools, plans were prepared to study the financial status, faculty structure, and present and proposed facilities (academic and research) in the dental schools of the United States.

Recognizing the need for developing more efficient methods and procedures in dental care, a project has been initiated in which auxiliary dental personnel perform an important function. This project is intended to augment the efficiency of the clinical operator through training and utilization of chair-side assistants, and adaptation of newly developed techniques (technical and administrative). The project is divided into two sections: one at the U. S. Merchant Marine Academy, Kings Point, Long Island; the other at the U. S. Marine Hospital, Norfolk, Virginia. There are certain factors inherent in each of the

populations served at these sites. It is anticipated that this project will enable the Service to improve its clinical care operations through this study experience and by final recommendations which will result from the study project.

The production of audio-visual aids to be used in the postgraduate dental education program of the Service and for public information is now in the formative stage. Clinical photographs, with accompanying history data, are being collected for the purpose of constructing film strips showing clinical oral pathology, oral surgical techniques, operative procedures, and prostheses (special and routine technical). Materials from clinical facilities of the Service, the dental schools, and independent collections are being contributed to this project.

NURSING RESOURCES

The high rate of withdrawal from schools of nursing, the understaffed hospitals, the waste of nurse power due to inefficient assignment of hospital personnel, and the substandard curricula in a high percentage of nursing schools call for constructive leadership, designed (1) to make extensive studies of the chronic difficulties which beset the nursing profession and its educational system, and (2) to galvanize and accelerate constructive action by local nursing groups and communities.

Assistance was given during 1950 to State groups, hospitals, and educational institutions in solving nursing problems. The bulk of staff time was spent on State surveys, partly due to high demand, partly because surveys are the foundation for improvements in specific areas of nursing.

STATEWIDE SURVEYS IN NURSING RESOURCES

Seven comprehensive State nursing surveys were undertaken in 1950 and a survey in Tennessee which had been started the preceding year was completed. The following table shows the current status of these surveys and their location.

SURVEYS COMPLETED		UNDER WAY
Tennessee	South Carolina	Louisiana
Illinois	Washington	New Jersey
South Dakota		Arizona

The surveys are geared to uncover difficulties in specific areas and to answer, on the basis of fact rather than opinion, questions such as these:

Why do nurses leave certain areas to seek work elsewhere? How can these nurses be retained? In what nursing fields is the deficit of nursing personnel a threat to the people's health? Should practical nurse programs be developed to supplement existing nurse power? How and where should recruitment campaigns be undertaken? In what way can nursing schools be improved?

A panorama of the national nursing situation has emerged from these stock-taking activities. Common problems have been identified, and initial steps toward improvement have been taken. Survey findings diagnose nursing ills on a local basis. For this reason, the surveys have enabled communities to get down to cases and solve their own problems.

The surveys have led to many concrete results, such as the centralization of small, inadequate schools into fewer, better schools; provision of psychiatric and tuberculosis training for student nurses; and detailed studies of nurse education costs. In every State some kind of council or committee has been formed to put survey recommendations into effect. State groups are exchanging ideas with other State groups, examining boards are reviewing plans for other boards in an ever widening circle of information and action.

IMPROVEMENT OF HOSPITAL NURSING SERVICE

General standards to measure the adequacy of nursing service have been developed by the nursing and hospital organizations from studies of "best current practice" or "opinion of need." Widespread use of these standards in hospitals of all sizes all over the country has resulted in awareness of their inadequacy. Hospital administrators, members of the medical profession, nurses, and citizens who use nursing service are requesting more realistic and scientific approaches to measure the adequacy of nursing care. They want nursing functions analyzed and perhaps redistributed. Activities which support nursing service but do not require nursing skills perhaps can be performed by less highly trained workers. This would release more skilled nurse time for more skilled nursing care. A few isolated studies have been made widely known to others.

At the request of a New England hospital and a university school of nursing, the Service collaborated in a detailed study of head nurse

functions. The technique evolved is being further refined by testing in a variety of situations and will result in a manual or guide for self-study of nursing functions in any hospital. The results of these studies will be shared with the American Nurses' Association Clearing House for Nursing Research. Use of a common method will enable hospitals to compare data and to set a pattern for better patient care. Better job descriptions will result in a clearer delineation of each person's functions. More effective utilization of nursing skills of both the professional and the nonprofessional worker will bring better care to the patient.

PROFESSIONAL COOPERATION

Nursing groups look to the Service for leadership in conducting educational institutes and for assistance in a multitude of problems where specialized experience is a valuable aid. In addition, the Service has become a vast clearinghouse of nursing information not available elsewhere. It is called upon by individuals and organizations in part because of its official national responsibility, and in part because of the special competence of its staff in certain fields.

FOREIGN QUARANTINE AND IMMIGRATION

A revision of the *Manual of Medical Examination of Aliens* was prepared for publication during 1950 and distributed to quarantine stations and to Public Health Service medical examination stations at consulates abroad. Copies were also furnished the Department of State for distribution to local physicians designated to examine visa applicants at United States consulates throughout the world where Service officers are not assigned.

An amendment to the Foreign Quarantine Regulations was issued to provide for extension of the duplicate pratique procedure with Canada. Ships or aircraft possessing a duplicate of a pratique issued at any Canadian port will be exempt from inspection in the United States. Ships and aircraft possessing a duplicate of a pratique issued at any port in continental United States (including Alaska) will be exempt from inspection in Canada, under Canadian regulations. Under former regulations the duplicate pratique procedure with Canada was limited to ships arriving at ports on the international waters between the United States and Canada. A study is being made to determine how many carriers will benefit by the simplified requirements.

QUARANTINE STATIONS

Key: M—Martime Port A—Airport L—Land Border Port

I. *PRINCIPAL CONTINENTAL STATIONS:

Baltimore, Md. (A—M)
Blaine, Wash. (L)
Boston, Mass. (A—M)
Brownsville, Texas (A—L—M)
Charleston, S. C. (A—M)
Detroit, Mich. (A—L—M)
El Paso, Texas (A—L)
Fort Monroe, Va. (A—M)
Galveston, Texas (A—M)
Hidalgo, Texas (L)
Houston, Texas (A—M)
Jacksonville, Fla. (A—M)
Key West, Fla. (A—M)
Laredo, Texas (A—L)
Los Angeles, Calif. (A—M)
Miami, Fla. (A—M)
Mobile, Ala. (A—M)
New Orleans, La. (A—M)
New York, N. Y. (A—M)
Nogales, Ariz. (A—L)
Philadelphia, Pa. (A—M)
Portland, Maine (A—M)
Portland, Oregon (A—M)
Sabine, Texas (M)
San Antonio, Texas (A)
San Diego, Calif. (A—M)
San Francisco, Calif. (A—M)
Savannah, Georgia (A—M)
Seattle, Wash. (A—M)
Tampa, Fla. (A—M)
Washington, D. C. (A—M)
West Palm Beach, Fla. (A—M)

II. *INSULAR STATIONS

Alaska: Anchorage (A—M)
Canal Zone: Balboa Heights (M)
Hawaii: Honolulu (A—M)
Puerto Rico: San Juan (A—M)
Virgin Islands: Charlotte Amalie (A—M)

III. FOREIGN STATIONS

Mexico, Mexico City
Austria, Salzburg
England, London
France, Paris
Germany:
  Berlin
  Bremen
  Frankfurt
  Hamburg
  Munich
  Stuttgart
Italy, Naples
Netherlands, Rotterdam
Cuba, Havana
Canada:
  Halifax
  Montreal
  Quebec
  Toronto
  Vancouver
  Victoria
  Windsor
  Winnipeg

*All stations perform Immigration Medical Examinations.

MEDICAL EXAMINATION OF ALIENS

In its capacity of medical adviser to the Department of State and the Immigration and Naturalization Service of the Department of Justice, the Public Health Service made 1,330,622 examinations of aliens seeking admission to the United States in 1950. Class A certificates, for diseases requiring mandatory exclusion of aliens from this country, were issued in 2,374 cases.

Of 226,710 visa applicants examined in foreign countries, 137,481 were displaced persons. Enactment of new displaced persons legislation in June 1950, authorizing admission of 195,744 additional immigrants during 1951, will require expansion of the medical examination activities of the Service abroad.

SERVICES TO OTHER FEDERAL AGENCIES

Officers of the Public Health Service assigned to direct health programs in other Federal agencies in 1950 were as follows:

Office of Vocational Rehabilitation, Federal Security Agency—Dr. Thomas B. McKneely
Social Security Administration, Federal Security Agency—Dr. Carl E. Rice
Foreign Service, Department of State—Dr. Virgil T. DeVault
Maritime Administration, Department of Commerce—Dr. Daniel J. Daley
United States Coast Guard, Treasury Department—Dr. Paul M. Stewart
Bureau of Prisons, Department of Justice—Dr. Stanley E. Krumbiegel
Bureau of Employees' Compensation, Department of Labor—Dr. Franklin J. Halpin
Bureau of Indian Affairs, Department of Interior—Dr. Fred T. Foard

IN CONCLUSION

The preceding chapters have presented the story of the evolution and development of the Public Health Service of the United States through the past 152 years. This concluding chapter of the history endeavors to summarize the extensive work of the Public Health Service during 1950. Some repetition, therefore, of activities mentioned in previous chapters occurs here. Reference to such subjects in this chapter was necessary in order to give an accurate picture of the Service in 1950.

Through the century and one-half of its existence, the Public Health Service has grown as additional responsibilities have been placed upon it by law and as funds have been made available by the Congress. Faithfully and well the Service has served this nation and looks forward with anticipation and confidence to the future.

EXPANDING HORIZONS OF PUBLIC HEALTH

According to Greek mythology, Aesculapius, the legendary father of medicine, had two daughters, Hygeia, the averter of ills, and Panacea, the healer of ills. From the names of these daughters of the father of medicine, are derived two words in common use today; hygiene, the prevention of disease, and panacea, a cure-all. The ancient Greeks apparently considered the prevention of disease somewhat apart from the treatment of ills. This concept has continued through the years even to the present time.

This division of effort implanted in the minds of many medical practitioners and the general public the idea that the prevention of disease was separate and apart from the treatment of the sick. During the early period of its development, modern public health work was concerned principally with the control of communicable diseases. The advances in the medical and allied sciences during the first half of this century and the consequent introduction of new therapeutic methods have emphasized the interdependency and relationship of all methods of disease prevention and treatment. The separate skills and arts of the two daughters of Aesculapius are thus becoming more and more nearly interchangeable. In the development of campaigns against tuberculosis and the venereal diseases, it early became apparent that adequate treatment of affected individuals was an essential measure in the program to control those diseases in the general population. As a result, special hospitals for the care of tuberculosis patients and rapid treatment centers for persons with venereal diseases were established, thereby linking closely the treatment of persons having tuberculosis or venereal diseases to the plans for the prevention of those diseases. The campaign now being developed against cancer places great emphasis upon early diagnosis and treatment, again stressing the proximate connection between prevention and treatment.

Based on the concept of *maintenance* of health, a gradual merging of prevention and treatment is coming about in the health field, utilizing for the benefit of the individual and the community, prevention or treatment, whichever is necessary to secure and maintain a state of health. This is of mutual advantage to the citizen and the community. Efforts of all those engaged in medical practice and public health work will thus be integrated and made more effective. This is to the advantage of the citizen and in the public interest.

Addenda

Source of Material

Material for the preparation of this history of the Public Health Service has been drawn from innumerable sources. It would be difficult, if not impossible, to attempt a complete listing of all the sources of data used.

The *Annual Reports* of the Service, as may be expected, have furnished a large share of essential information. They have been drawn upon freely, especially for the early years, beginning with the first *Annual Report* in 1872. The Public Health Service was under the direction of the Treasury Department for 141 years, until July 1, 1939; thus it has been necessary to refer to *Annual Reports* of the Secretary of the Treasury for data relating to the earlier period. Numerous official reports of the Service, the *Public Health Reports, Public Health Bulletins,* and official documents on file in the Headquarters of the Public Health Service and in the National Archives have been consulted. Perfectionists, therefore, need not be disturbed by what appears to be varying types of presentations even within the same chapter.

In the comment and description regarding various scientific investigations, no effort has been made in this volume to authenticate and support the statements made by references to the literature. This history is not intended to be a scientific discussion of the subjects presented, but rather a general review of the work done by the Public Health Service in several fields of research and demonstration.

Included below are general references to the major sources of information used in the preparation of this book. Pertinent facts were also secured from a number of Service officers through written or oral communications. The staff of the library at the National Institutes of Health has given invaluable assistance in many ways.

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About the Author

A NATIVE of Alabama, Dr. Ralph C. Williams received his medical degree from the University of Alabama in 1910. For three years he was engaged in the private practice of medicine in that State and for the following three years he was with the Alabama State Health Department. In 1917 he was commissioned in the Regular Corps of the Public Health Service, and has served in a variety of assignments in different sections of the United States. His assignments have included rural sanitation surveys, mine sanitation investigations, duty at a Marine Hospital, the influenza pandemic of 1918, and bubonic plague epidemic duty in New Orleans, Louisiana; Beaumont, Texas; and Tampico, Mexico. Doctor Williams was editor of the *Public Health Reports* and in charge of public relations for the Public Health Service for a period of about nine years. From 1936 until 1942 he was detailed as Chief Medical Officer of the Farm Security Administration of the Department of Agriculture. From 1942 until late in 1943 he served as Director of Public Health Service District No. 1, with headquarters in New York City. Following a reorganization of the Service and the creation of four new Bureaus, in December 1943 he became the first Chief of the Bureau of Medical Services, serving in that capacity until 1951 as Assistant Surgeon General, with the rank of Major General.

From the very early years of his career, Doctor Williams' interest in the history of the Service was stimulated and, with his various assignments, that interest became an absorbing hobby. He devoted much time to the accumulation of historical material, both from the official records and from the officers with whom he was associated. Thus it is that this competent, able administrator with 37 years of experience in many types of public health activities is especially well qualified to have prepared the comprehensive history of the Public Health Service which appears on the foregoing pages.

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UNITED STATES PUBLIC HEALTH SERVICE

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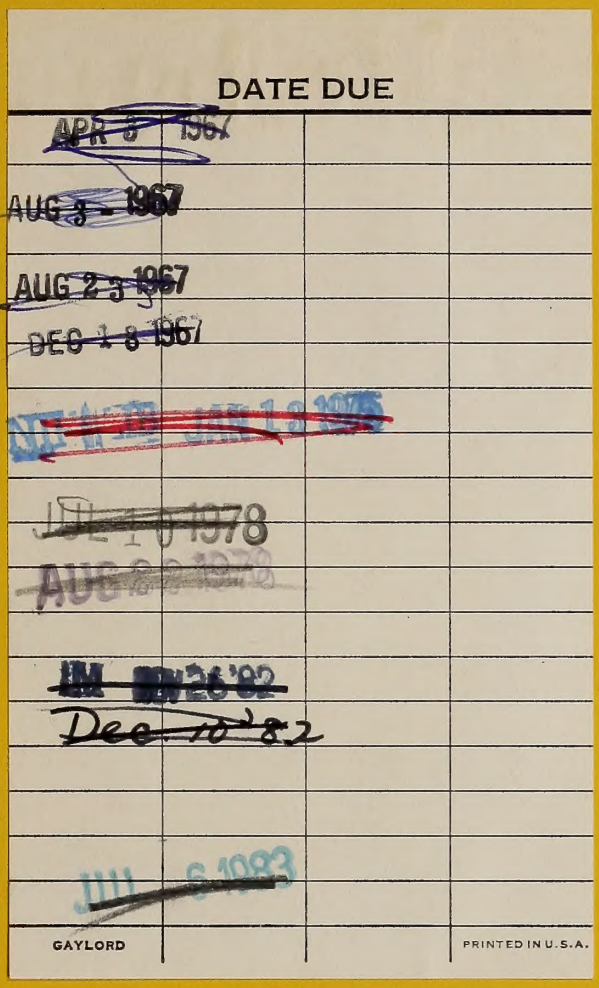

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